ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket No. CP15-554-000

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. CP15-555-000

Resource Report 10
Alternatives
Excerpts from Full Report

Final

Prepared by

NATURAL RESOURCE GROUP

an ERM Group company

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
Appalachian Trail	Appalachian National Scenic Trail
ATC	Appalachian Trail Conservancy
Atlantic	Atlantic Coast Pipeline, LLC
bcf/d	billion standard cubic feet per day
DOT	State/Commonwealth Department of Transportation
DTI	Dominion Transmission, Inc.
DVP	Dominion Virginia Power
FERC	Federal Energy Regulatory Commission
FWS	U.S. Fish and Wildlife Service
GDS-NWR	Great Dismal Swamp National Wildlife Refuge
GIS	geographic information system
GWNF	George Washington National Forest
GWNF LRMP	George Washington National Forest Land and Resource Management Plan
HDD	horizontal directional drill
hp	horsepower
I-295	Interstate 295
I-64	Interstate 64
I-79	Interstate 79
I-95	Interstate 95
INGAA	Interstate Natural Gas Association of America
JNF	Jefferson National Forest
kV	kilovolt
M&R	metering and regulating
MAOP	maximum allowable operating pressure
MMDth/d	million dekatherms per day
MNF	Monongahela National Forest
Mountain Valley	Mountain Valley, LLC
MP	milepost
MPC	Monongahela Power Company
MVP	Mountain Valley Pipeline
NPS	National Park Service
NRA	National Recreation Area
PEC	Progress Energy Carolinas, LLC
PM_C	course particulate matter
PM_f	fine particulate matter
PNBP	Petersburg National Battlefield Park
Projects	Atlantic Coast Pipeline and Supply Header Project
psig	pounds per square inch gauge
SHP	Supply Header Project
SNP	Shenandoah National Park
Transco	Transcontinental Gas Pipe Line Company, LLC
USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service

USGS	U.S. Geological Survey
VDCR	Virginia Department of Conservation and Recreation
VOF	Virginia Outdoors Foundation
West Penn	West Penn Power
WMA	Wildlife Management Area

ATLANTIC COAST PIPELINE – Docket No. CP15-554-000
SUPPLY HEADER PROJECT – Docket No. CP15-555-000

10.0 RESOURCE REPORT 10 – ALTERNATIVES

The excerpts from the full Resource Report 10 provided in this submittal contain discussions, maps, and tables pertaining to route alternatives investigated as alternatives to those sections of Atlantic's proposed route that cross U.S. Forest Service (USFS) lands. Specifically, Section 10.7 (Conceptual Route Alternatives) is contained in its entirety; the USFS-relevant portions of Section 10.8 (Major Route Alternatives) are provided; and two new sections are added to Section 10.9 (Route Variations). Additional desktop data and analyses have been added for most of these the alternatives routes.

10.7 CONCEPTUAL ROUTE ALTERNATIVES

Where practical, and depending on site-specific conditions, new natural gas transmission pipelines can sometimes be collocated with existing linear corridor facilities (e.g., other pipelines, electric transmission lines, highways, or railroads) to minimize impacts on environmental and other resources. A pipeline is considered collocated with an existing linear corridor facility if the new right-of-way for the pipeline is adjacent to or very near (within a few hundred feet) of the existing facility. A pipeline can parallel an existing linear corridor facility without being collocated with the existing facility, but this often results in multiple clear-cuts along similar paths with no reduction in impacts on environmental and other resources.

The three criteria listed below are generally used to identify and evaluate opportunities to route a new natural gas transmission pipeline adjacent to existing linear corridor facilities.

- The location and orientation of existing facilities relative to the new pipeline. The existing facilities must provide a relatively direct path between the proposed receipt and delivery points for the new pipeline. Otherwise, routing adjacent to these existing facilities increases the length of the pipeline, which results in greater environmental impact and added cost to the project.

- The nature of terrain along existing facilities. In some areas, the landforms crossed may not allow for the construction of a pipeline adjacent to an existing facility due to factors such as side slope, limitations on the amount of space available for new construction, or the orientation of landforms crossed.

- The nature of land uses along the existing facilities. Developed lands (including residential, commercial, and industrial lands) are often found along linear corridor facilities such as highways and railroads. Routing a new pipeline to avoid these developed areas often results in parallel (as opposed to adjacent) alignments and increases the length (and therefore the environmental impact and cost) of a new pipeline.

This section of Resource Report 10 provides an evaluation of major conceptual collocation route alternatives for the proposed Atlantic Coast Pipeline (ACP) pipelines. [1] In addition to these conceptual alternatives, Atlantic Coast Pipeline, LLC (Atlantic) and Dominion Transmission, Inc. (DTI) evaluated potential collocation alternatives for the ACP and Supply Header Project (SHP) (collectively, the "Projects") in areas where existing pipelines, electric transmission lines, or roads either intersect or run parallel to and near the proposed Projects. Potential route alternatives and variations adjacent to existing facilities which would meet the purpose and need of the Projects and avoid or minimize impacts are discussed in Sections 10.8 and 10.9 below. Desktop review of other potential collocation route alternatives (i.e., additional to those discussed in Sections 10.7.1, 10.8, and 10.9 below) identified significant impediments with the routes with regard to terrain, existing developments, or increased length of the Projects. A set of figures and a table providing information on these other potential collocation alternatives, including the reasons they are not feasible alternatives, are provided in Appendix 10A of this report. Based on the information in this table, these alternatives were rejected for further analysis.

10.7.1 Adjacent to Existing Pipelines

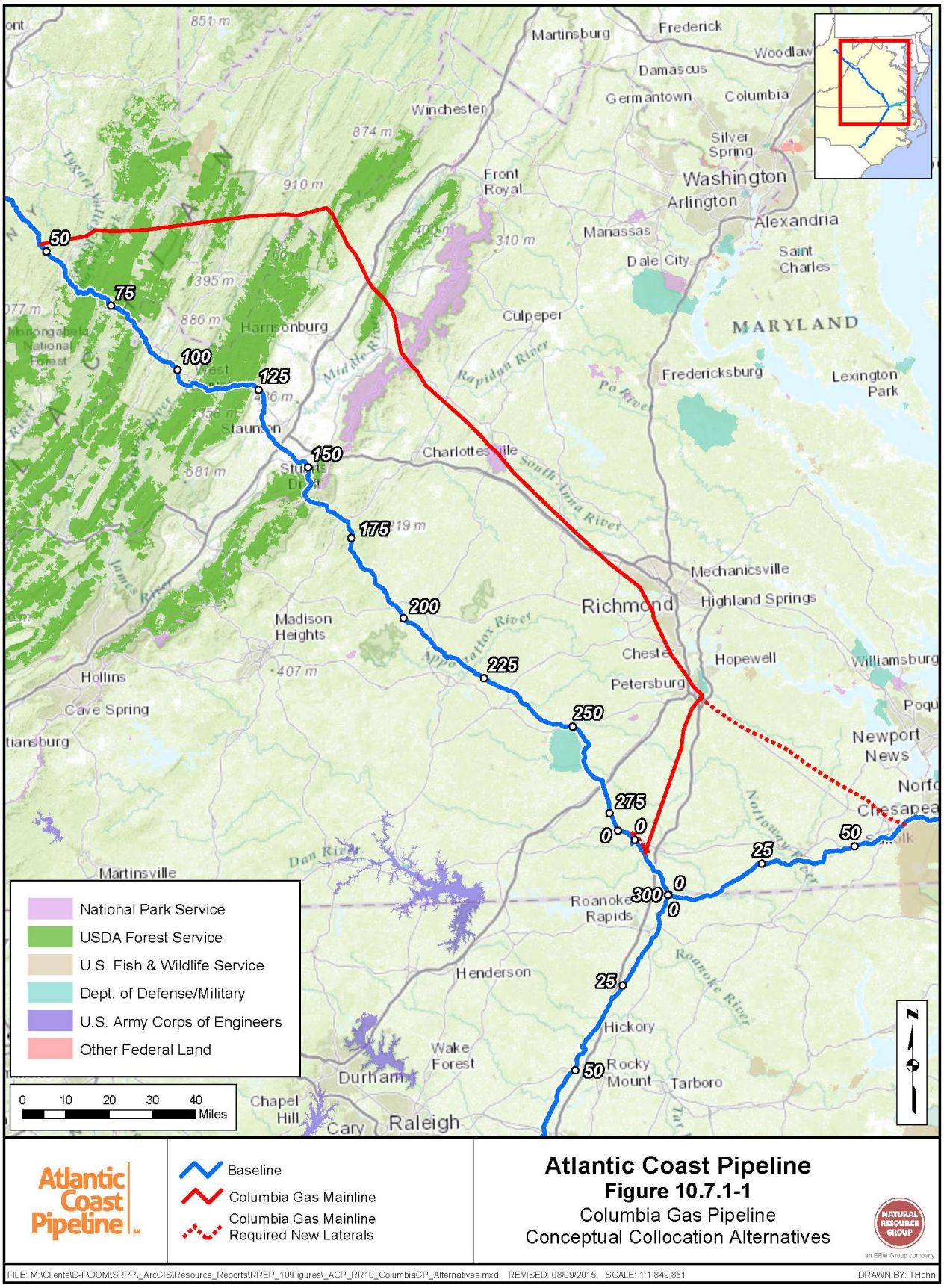
Atlantic evaluated a conceptual alternative route along the existing Columbia pipeline system in West Virginia and Virginia. Atlantic additionally evaluated three conceptual route alternatives for collocating portions of the proposed AP-1 mainline and proposed Mountain Valley Pipeline (MVP) in a common corridor. Atlantic also evaluated a conceptual route similar to the route proposed by Transcontinental Gas Pipe Line Company, LLC (Transco) for the proposed Appalachian Connector Project. [2] Each of these alternatives is discussed below.

10.7.1.1 Columbia Gas Pipeline

Starting approximately at milepost (MP) 47 of the AP-1 mainline route in Randolph County, West Virginia, a conceptual alternate route for the pipeline adjacent to the existing Columbia system would initially head approximately 74 miles to the east, passing through Randolph, Pendleton, Grant, and Hardy Counties, West Virginia. The route would then pivot to the southeast and continue for approximately 110 miles, crossing Shenandoah, Rockingham, Page, Green, Orange, Albemarle, Louisa, and Goochland Counties, Virginia. The route would then head to the south/southeast for approximately 36 miles, passing through Goochland, Powhatan, and Chesterfield Counties and the Cities of Colonial Heights and Petersburg, Virginia. On the east side of Petersburg, the route would continue approximately 42 miles to the southwest through Prince George, Dinwiddie, Sussex, and Greensville Counties, Virginia, terminating approximately at MP 289 of the proposed AP-1 mainline route (see Figure 10.7.1-1).

[1] A number of people who attended the ACP Open Houses or filed comments with the FERC said that the proposed pipelines should be adjacent to existing pipelines, electric transmission lines, or roads.

[2] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to the existing Columbia system or the proposed MVP and Appalachian Connector Pipeline systems.


Martinsburg
Frederick
Woodlaw
Damascus
Germantown
Columbia
Winchester
Silver Spring
Washington
Arlington
Alexandria
Front Royal
Manassas
Saint Charles
Dale City
Culpeper
MARYLAND
Harrisonburg
Fredericksburg
Lexington Park
Rapidan River
Po River
Staunton
Charlottesville
South Anna River
Mechanicsville
Richmond
Highland Springs
Madison Heights
Hopewell
Williamsburg
Petersburg
Hollins
Cave Spring
Newport News
Martinsville
Dan River
Roanoke Rapids
Henderson
Roanoke River
Hickory
Wake Forest
Rocky Mount
Tarboro
Durham
Chapel Hill
Cary
Raleigh
50
75
100
125
150
175
200
225
250
275
0
0
50
25
0
300
0
25
50
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 20 30 40
Miles
Baseline
Columbia Gas Mainline
Columbia Gas Mainline
Required New Laterals
Atlantic Coast Pipeline
Figure 10.7.1-1
Columbia Gas Pipeline
Conceptual Collocation Alternatives
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_ColumbiaGP_Alternatives.mxd, REVISED: 08/09/2015, SCALE: 1:1,849,851
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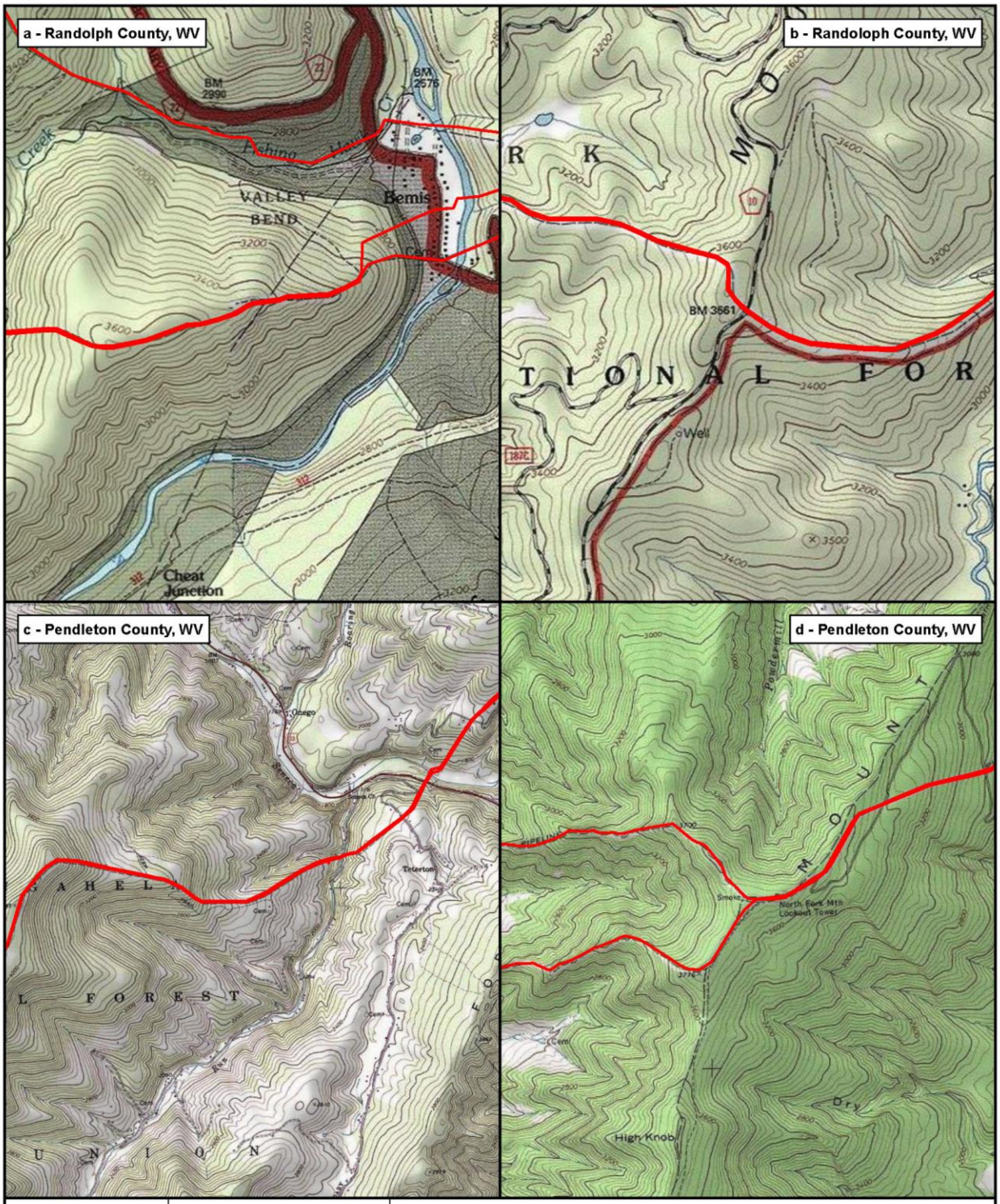
In addition to the conceptual mainline route, an alternate route for the proposed AP-3 lateral and a new pipeline lateral to access the proposed delivery points in Brunswick and Greensville Counties, Virginia would also be required. The alternative route for AP-3 would follow an existing Columbia lateral from a point near the City of Petersburg, Virginia, southeast into Hampton Roads. The route would measure approximately 56 miles in length, crossing Prince George, Sussex, Surry, Southampton, and Isle of White Counties and the City of Suffolk, Virginia. The route would terminate approximately at MP 65 of the currently proposed AP-3 lateral, and then follow the same alignment as the AP-3 lateral to its terminus along the Southern Branch Elizabeth River. The new pipeline lateral to the delivery points in Brunswick and Greensville Counties would measure about 10 miles in length (see Figure 10.7.1-1).

Relative to the corresponding segments of the proposed AP-1 mainline and AP-3 lateral routes, the conceptual alternative routes would add a cumulative total of approximately 21 miles to the length of the ACP, which would increase the environmental impacts and cost of the Project. The additional length would increase the area of impact for the ACP by a minimum of 312 acres and encumber an additional 188 acres in the permanent, maintained easements for the pipelines.

The additional length and cost notwithstanding, there are several issues with a route adjacent to the existing Columbia system which preclude its use as a viable alternative. Collocation in the mountainous areas of West Virginia (including in the Monongahela National Forest [MNF]) and Virginia is not feasible due to rugged topography and space constraints on the ridges that the Columbia system follows. Most of the existing Columbia corridor in these areas contains three existing pipelines of 26- or 36-inch-outside diameter. In several places, the Columbia pipelines diverge from a common corridor into two parallel corridors because there was insufficient room on the ridges to build three adjacent pipelines.

For most of the route across West Virginia and parts of west-central Virginia, the AP-1 mainline could not be constructed adjacent to the existing Columbia pipelines due to a lack of sufficient space to safely construct a new large diameter pipeline. Additionally, the steep terrain would prevent a collocated route from pulling away and quickly returning to an alignment adjacent to Columbia where space constraints are encountered. In many areas, the AP-1 mainline would need to be routed along a new, greenfield right-of-way, which would eliminate the benefits of collocation with an existing utility, such as reduced forest clearing, and also require a new corridor across the MNF. Examples of difficult terrain along the existing Columbia system are depicted on Figure 10.7.1-2.


a - Randolph County, WV
b - Randolph County, WV
c - Pendleton County, WV
d - Pendleton County, WV
Bemis
VALLEY
BEND
Cheat
Junction
BM 2990
BM 2575
BM 3661
Well
Tiverton
Smoke
North Fork Mtn
Lookout Tower
High Knob
Dry
Atlantic Coast Pipeline
Columbia Gas Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-2
Examples of Difficult Terrain along the Columbia Gas Pipeline System
NATURAL RESOURCE GROUP
an ERM Group company
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In addition to difficult terrain, there are significant land use constraints that would prohibit constructing a new pipeline adjacent to the existing Columbia system. As discussed in Section 10.8.1.2 below, the existing Columbia system across the MNF is located near or within several sensitive areas. For example, the system is located directly adjacent to the Laurel Fork North Wilderness Area and it crosses the Spruce Knob-Seneca Rocks National Recreation Area (NRA). Additionally, there are several other Wilderness Areas in the vicinity of the Columbia system, including the Otter Creek, Roaring Plains, and Dolly Sods Wilderness Areas, as well as backcountry recreation areas. An alternate greenfield route extending at least 15 miles to the north of the Columbia system would be necessary to avoid the Wilderness Areas, NRA, and backcountry recreation areas, and the route would need to cross Canaan Valley National Wildlife Refuge. The alternate route would add an additional 227 acres of temporary impact and 136 acres of new permanent right-of-way to the Project. [3]

In order to preserve the unique characteristics of federally designated Wilderness Areas and Wilderness Study Areas and lessen the environmental impacts of the underground pipeline, Atlantic has worked diligently to identify a route alignment that avoids impacts to these areas where there are available routing options nearby that meet the Project's purpose and need. Wilderness Areas are federally owned areas within National Forests or on other federally-managed lands that have been designated by Congress and signed into law by the President with the objective to preserve the lands in their natural, undisturbed, and undeveloped condition. Wilderness Areas, as defined in the 1964 Act establishing the National Wilderness Preservation System, are lands "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain…[and are]… undeveloped lands retaining [their] primeval character and influences without permanent improvements or human habitation." [4]

There are two options where natural gas pipelines could traverse a Wilderness Area, but neither is preferable when alternative routing options exist. The President, at his or her discretion, may authorize construction of a natural gas pipeline though a federal Wilderness Area. Also, Congress could enact a law signed by the President to amend a specific congressionally designated Wilderness Area, directing the approval of a pipeline route though a specific Wilderness Area. Atlantic believes that it should identify an alternative routing option that avoids any designated Wilderness Area.

In addition to USFS lands, the Columbia system crosses Federal lands owned and/or managed by the National Park Service (NPS) in three locations: approximately 3.8 miles of the Shenandoah National Park (SNP) in Rockingham and Greene Counties, Virginia; approximately 5.2 miles of the Green Springs National Historic Landmark District in Louisa County, Virginia; and approximately 1.2 miles of the Petersburg National Battlefield Park (PNBP) in the City of

[3] This assumes that the alternate route would increase the length of the AP-1 mainline by approximately 15 miles relative to the proposed route. The acreage estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline

[4] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the AP-3 lateral and new lateral to the delivery points in Brunswick and Greensville Counties. The conceptual AP-1 mainline adjacent to Columbia would result in an additional 303 acres of construction right-of-way and 182 acres of permanent easement. The conceptual route for the AP-3 lateral would result in a reduction of 82 acres for the construction right-of-way and 55 acres for the permanent easement because this route would be 9 miles shorter than the proposed route. The new lateral to the delivery points in Brunswick and Greensville Counties would result in an additional 91 acres of construction right-of-way and 61 acres of permanent easement

Petersburg, Virginia. Currently, there is no general authority available to the NPS to approve rights-of-way for natural gas pipelines across NPS lands (other than the Blue Ridge Parkway). Instead, park- or pipeline-specific legislation enacted by the Congress and signed into law by the President is required to authorize the NPS to consider, review, analyze, and approve the construction of a natural gas pipeline across NPS lands. Based on recent examples of park- and pipeline-specific legislative efforts, the time required to secure passage by Congress, approval by the President and implementation by NPS is far too long to meet the Projects' purpose and need. The Projects' in-service date of November 2018 would not be met and the delivery of natural gas for power generation, which is the intended use for approximately 79 percent of the gas delivered by Atlantic, would not occur within the timeframe required to contribute to Virginia's and North Carolina's Clean Power Plan compliance obligations. Consequently, alternate greenfield routes would need to be identified to avoid these features.

The SNP is a long linear park extending approximately 70 miles along the Blue Ridge Mountains between Waynesboro and Front Royal, Virginia (see Figure 10.7.1-1). The existing Columbia system crosses the SNP in the vicinity of the town of Elkton. An alternate route to the south of the SNP would need to pass south of Waynesboro, which would approximate the current AP-1 mainline where it crosses the Blue Ridge Mountains. An alternate route around the SNP to the north would need to pass north of Front Royal, which would add approximately 60 miles of additional pipeline to the conceptual route alternative (an additional 909 acres of temporary impact and 546 acres of new permanent right-of-way) and increase the cost of the ACP. Moreover, an alignment this far to the east of the currently proposed AP-1 mainline route could not be configured to deliver gas to Atlantic's customers with reasonable efficiency. Additional infrastructure, including new laterals, would be required to provide access for Atlantic's customers.

A conceptual route alternative adjacent to the existing Columbia system could be aligned to avoid the Green Springs National Historic Landmark District in Louisa County, Virginia with limited effect on the length, area of impact, and cost of the ACP. However, a route adjacent to the existing Columbia system could not easily be configured to avoid the Petersburg National Battlefield Park (PNBP). The Cities of Colonial Heights and Petersburg have built out substantially to the northern and western boundaries of the PNBP. To the east, the PNBP is bounded by the Fort Lee Military Reservation, which itself is bounded to the east by the City of Hopewell. An alternate route to the west around Petersburg and the PNBP would be feasible, and the length would be similar to the corresponding segment of the conceptual route alternative (approximately 20 miles), but the route would be entirely greenfield, which would eliminate the benefits of collocation in this area. An alternate route to the east of the PNBP would need to pass east of Hopewell, which would increase the length of the conceptual route alternative by approximately 10 to 12 miles (an additional 151 to 182 acres of temporary impact and 91 to 109 acres of permanent easement), all of which would be greenfield.

There are other areas along the existing Columbia system where residential or commercial developments have encroached on the existing right-of-way. Many of these areas would need to be avoided by minor route variations measuring several miles in length. The route variations would increase the length of the conceptual route alternative, and they would not be collocated with an existing facility.

Given the terrain and land use constraints along the Columbia system, much of the AP-1 mainline would need to be routed along greenfield rights-of-way, which would significantly increase the length of the proposed pipelines, the environmental impact of the ACP, and the cost of the ACP. For these reasons, a route adjacent to Columbia is not a viable or feasible alternative to the proposed route of the ACP.

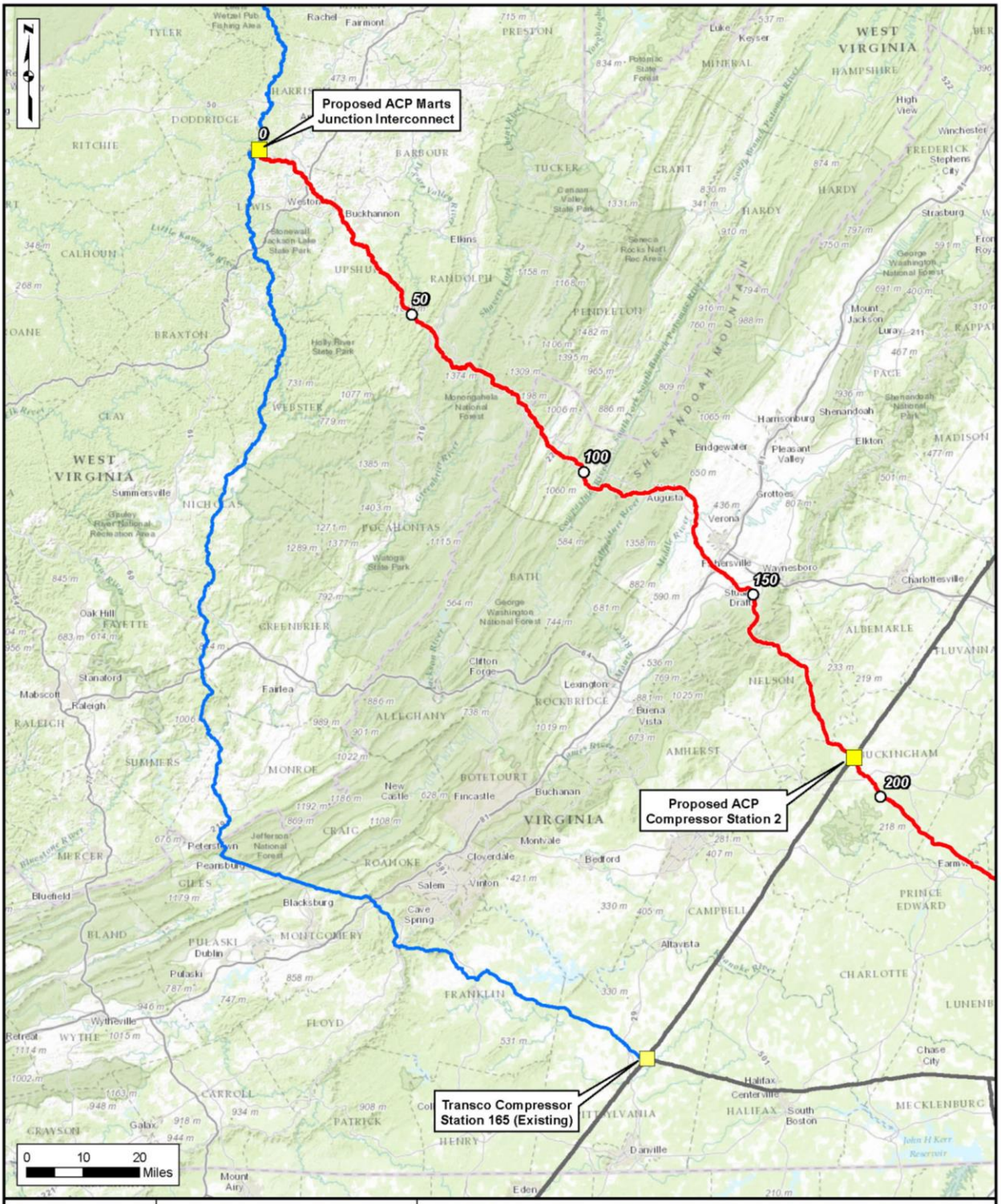
Single Pipeline Option

In a letter to the Commission dated July 30, 2015, the USFS requested that Atlantic evaluate the potential to increase the capacity of the existing Columbia system by replacing existing pipe or through other means that would eliminate or minimize the need for looping or other expansion of the existing right-of-way. Atlantic has evaluated this scenario and determined it to be infeasible for several reasons. First, Atlantic cannot speculate as to the operational or regulatory feasibility, constructability, or willingness of Columbia to provide a lift and lay expansion of its existing system within its existing right-of-way. Even if identified, the utilization of such capabilities to serve the needs of ACP customers may not be consistent with Columbia's own plans for service to its customers, and may affect that system's existing reliability, flexibility, modernization, and/or growth. Second, this concept would require Atlantic to rely on Columbia to execute an expansion of its system, which would require Columbia to navigate many of the same land use constraints related to crossing Wilderness Areas, National Recreation Areas, SNP, and other resources such as those described above. Furthermore, the existing Columbia system impacts resources that ACP has avoided in its Project plan, such as SNP. In that regard, expansion of the Columbia system would not be preferable to the proposed route.

For all these reasons, it would not be possible for ACP to rely on an expansion of Columbia's existing system within the timeframe required to meet the purpose and need of the ACP. Additionally, relying on a third party to operate and maintain a portion of its system would require negotiation of terms and conditions for joint operations to ensure the operational reliability, flexibility, and expandability of the ACP, which are all requirements of Atlantic's customers, while demonstrating that Columbia's existing customers are not disadvantaged.

10.7.1.2 Mountain Valley Pipeline

As noted in Section 10.6.2, Mountain Valley, LLC (Mountain Valley) proposes to construct and operate approximately 294 miles of 42-inch outside diameter natural gas transmission pipeline between an existing Equitrans transmission system in Wetzel County, West Virginia, and an interconnection with the existing Transco system in Pittsylvania County, Virginia (at Transco's existing Compressor Station 165). The route of the proposed MVP pipeline passes within approximately 0.6 mile of the proposed AP-1 mainline at the Marts Junction Interconnect (MP 0.0) in Harrison County, West Virginia. From this point, the proposed MVP pipeline heads due south into western Virginia near Blacksburg, then southeast into south-central Virginia. In contrast, the proposed AP-1 mainline route heads southeast into central and southeastern Virginia (see Figure 10.7.1-3).


Proposed ACP Marts Junction Interconnect
0
50
100
150
200
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
0 10 20 Miles
Proposed ACP AP-1 Mainline
Proposed MVP Pipeline
Existing Transco Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-3
Location of the Mountain Valley Pipeline relative to the Atlantic Coast Pipeline
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As discussed in Section 10.2 above, the ACP and SHP were designed based on customer requirements and precedent agreements which specify the locations of receipt and delivery points on the ACP. The ACP and SHP are designed to meet customer requirements for securing natural gas supply and reaching their local distribution and power generation markets. To that end, the customers' precedent agreements specify the locations of the ACP receipt and delivery points. In order to meet the purpose and need of the Project, Atlantic is required to utilize these locations as specified in the precedent agreements. Modifying the locations of the receipt and delivery points for the Project would not meet the Project objectives, would impact the existing agreements with customers, and would limit customers' abilities to move the natural gas to local distribution and power generation markets.

The precedent agreements require a receipt and delivery point along the existing Transco system between Transco Compressor Station 165 in Pittsylvania County, Virginia, and the interconnect between Transco and the existing Columbia system in Louisa County, Virginia, and at various other delivery points in southeastern Virginia and North Carolina. The locations of these points were determined by customer needs and an assessment of flow dynamics relative to receipts and deliveries of natural gas. Locations were also chosen to mitigate the uncertainty of future upstream pipeline restrictions. In addition, these points were chosen for reliability and diversity benefits for the ACP customers. The Project customers requested that the ACP be geographically diverse from other major pipelines serving generation facilities.

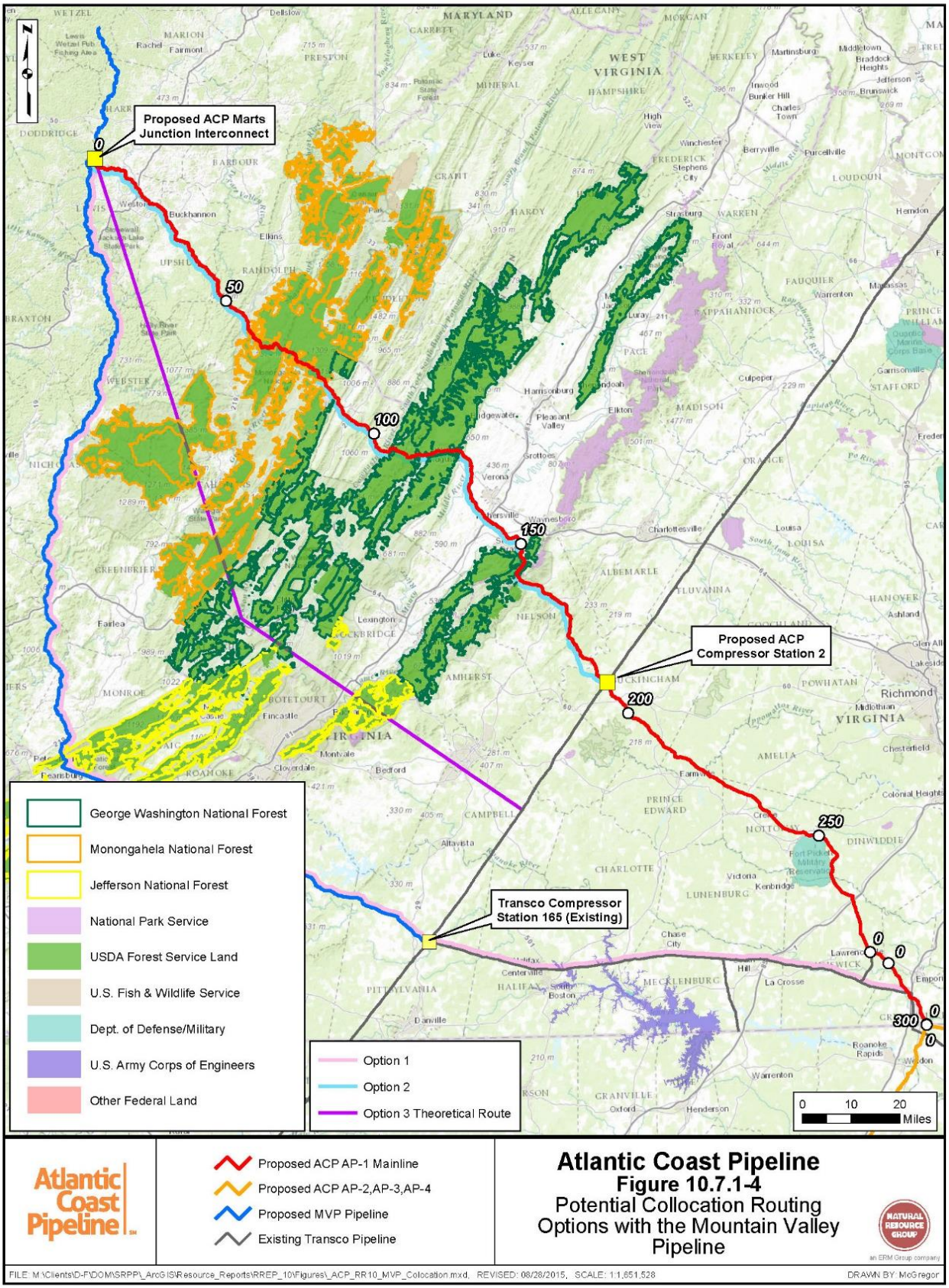
The MVP was designed to interconnect with the existing Transco system at Transco's Compressor Station 165 to deliver gas to customers connected to the Transco system. The ACP and MVP projects serve different end-use markets and customers, and they do not share common delivery points. As a result, the locations receipt and delivery points on the proposed ACP and MVP were taken into account in evaluating collocation opportunities for the projects.

Atlantic evaluated three conceptual options for collocating portions of the proposed ACP and MVP pipelines along a common corridor (see Figure 10.7.1-4). Option 1 would involve routing the proposed AP-1 mainline adjacent to the proposed MVP pipeline along the current MVP route between the proposed Marts Junction Interconnection in Harrison County, West Virginia, and Transco's existing Compressor Station 165.[5] Option 2 would involve routing the proposed MVP pipeline along the current AP-1 mainline route between the proposed Marts Junction Interconnection and Atlantic's currently proposed interconnection with the existing Transco system in Buckingham County, Virginia (i.e., at MP 191/the Woods Corner metering and regulating [M&R] Station).[6] Option 3 would involve routing both the AP-1 mainline and MVP pipelines along a common, intermediate alignment between the currently proposed ACP and MVP routes.[7] Atlantic additionally evaluated the potential to transport the combined capacities of the ACP and MVP in a single pipeline.

[5] Option 1 assumes that both the MVP and ACP could interconnect with Transco at Transco's existing Compressor Station 165 in Pittsylvania County, Virginia.

[6] Option 2 assumes that both the MVP and ACP could interconnect with Transco at the currently proposed interconnect with Transco for the ACP in Buckingham County, Virginia.

[7] Option 3 assumes that both the MVP and ACP could interconnect with Transco at an intermediate point along Transco's existing system.


Proposed ACP Marts Junction Interconnect
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
0
50
100
150
200
250
300
George Washington National Forest
Monongahela National Forest
Jefferson National Forest
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
Option 1
Option 2
Option 3 Theoretical Route
0 10 20 Miles
Proposed ACP AP-1 Mainline
Proposed ACP AP-2,AP-3,AP-4
Proposed MVP Pipeline
Existing Transco Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-4
Potential Collocation Routing Options with the Mountain Valley Pipeline
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Option 1

Under the Option 1 scenario, the proposed AP-1 mainline would follow the proposed MVP route along a greenfield corridor for approximately 158 miles to the south, passing through Lewis, Braxton, Webster, Nicholas, Greenbrier, Fayette, Summers, and Monroe Counties, West Virginia, and crossing into Giles County, Virginia. The AP-1 mainline would then continue to collocate with the MVP route for approximately 31 miles to the east/southeast along an existing electric transmission line across Giles and Montgomery Counties, Virginia. The two routes would then head south/southeast for approximately 71 miles along a greenfield corridor through Roanoke, Franklin, and Pittsylvania Counties, Virginia. The proposed MVP pipeline would terminate at Transco's existing Compressor Station 165 in Pittsylvania County. The proposed AP-1 mainline would continue from this point for approximately 102 miles to the east along an existing 20-inch-diameter Transco pipeline, crossing Pittsylvania, Halifax, Charlotte, Mecklenburg, Brunswick, and Greensville Counties, Virginia. It would intersect the currently proposed AP-1 mainline route near MP 292 in Greensville County, Virginia.

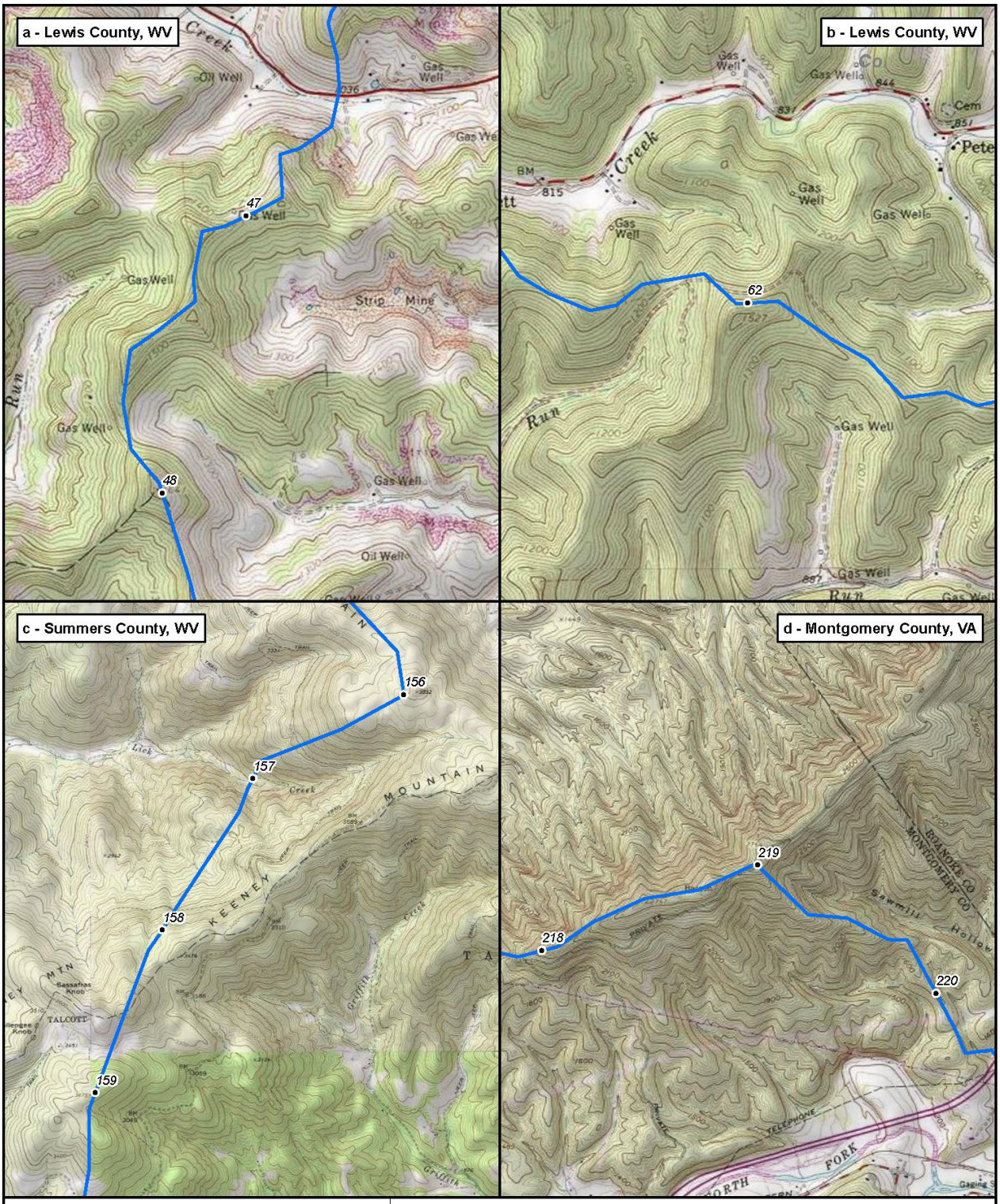
The Option 1 scenario, if technically feasible, would provide two potential advantages relative to the ACP and MVP projects as currently proposed (assuming both projects are permitted and built): 1) greater collocation with other linear corridor facilities (up to approximately 188 miles); and 2) avoidance of the MNF and George Washington National Forest (GWNF) along the current AP-1 mainline route (though the Option 1 route would cross a portion of the Jefferson National Forest (JNF)). [8]

Because the proposed ACP and MVP pipelines do not share common delivery points, however, the Option 1 scenario would increase the length of the AP-1 mainline by approximately 70 miles due to the need to route the pipeline from Pittsylvania County into southeastern Virginia. This would increase the area of impact for the ACP by at least 1,061 acres and encumber an additional 636 acres in the permanent, maintained easement for the pipeline. [9] Additionally, because it is significantly longer than the AP-1 mainline as proposed, this option would require additional compression.

A major drawback to the Option 1 scenario is that the mountainous terrain along portions of the MVP route, particularly in northern West Virginia, would not allow for construction of two large diameter pipelines in a common corridor (see Figure 10.7.1-5). Much of the MVP route in northern West Virginia follows ridgelines with narrow crests and steep side-slopes. There is insufficient space along the tops of the ridgelines for two adjacent pipelines in these areas. Based on review of U.S. Geological Survey (USGS) topographic quadrangles, there do not appear to be opportunities to collocate the two pipelines for the initial 40 miles of the route between the crossing of Kincheloe Creek in Harrison County and the crossing of Elk River in Webster County, West Virginia. Additionally, there are limited opportunities to collocate the two pipelines in a common corridor south of the Elk River along the current MVP route. There are several mountain crossings with steep terrain along the MVP route in southern West Virginia and Virginia that would preclude construction of two adjacent pipelines on the same landform.

[8] The proposed MVP route crosses about 2.1 miles of the Jefferson National Forest. However, Mountain Valley is currently evaluating potential alternative routes which would increase the crossing length in the forest.

[9] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.


a - Lewis County, WV
b - Lewis County, WV
c - Summers County, WV
d - Montgomery County, VA
47
48
62
156
157
158
159
218
219
220
Proposed MVP Pipeline
MVP Milepost
Atlantic Coast Pipeline
Figure 10.7.1-5
Examples of Difficult Terrain Along the Proposed Mountain Valley Pipeline
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Examples of difficult terrain along the MVP route south of Elk River include:

- the crossings of Big Mountain and surrounding peaks in Webster County, West Virginia;
- the crossings of unnamed mountaintops and ridgelines in the vicinity of Quinwood in Nicholas and Greenbrier Counties, West Virginia;
- the crossings of Little Sewall Mountain and surrounding peaks in Greenbrier County, West Virginia;
- the crossings of Red Spring and Keeney Mountains in Summers County, West Virginia (see Figure 10.7.1-5c);
- the crossings of High Top and Little Top Mountains in Monroe County, West Virginia;
- the crossing of Fort Lewis Mountain in Montgomery County, Virginia (see Figure 10.7.1-5d);
- the crossing of Poor Mountain in Roanoke County, Virginia; and
- the crossing of Cahas Mountain in Franklin County, Virginia.

Because of the difficult terrain, much of the AP-1 mainline in West Virginia under the Option 1 scenario would need to be routed along a separate corridor from MVP. This would include at least 40 miles of the route in the area immediately south of the proposed Marts Junction Interconnection to the Elk River crossing, and significant stretches of the route around the larger mountains and ranges in southern West Virginia and western Virginia. The new rights-of-way required for both pipelines in these areas would eliminate the benefits of collocation, such as reduced clearing of forests, forest fragmentation, and disturbance of other lands.

Conceptually, the Option 1 scenario for the AP-1 mainline could in some places increase collocation and avoid crossings of the MNF and GWNF (though they would increase the crossing of the JNF). These potential advantages would be offset by the limited opportunities for collocation along the MVP route in West Virginia as well as the substantial additional length, area of impact, and cost to construct along this or a similar route. Additionally, as noted in Section 10.6.2.2 above, the proposed MVP route would require approximately 294 miles of pipeline to interconnect with the Transco system, compared to approximately 192 miles of pipeline for the ACP to connect with the Transco system. For all these reasons, the Option 1 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as proposed.

Option 2

Under the Option 2 scenario, the proposed MVP pipeline would follow the AP-1 mainline route to the southeast for approximately 191 miles through Lewis, Upshur, Randolph,

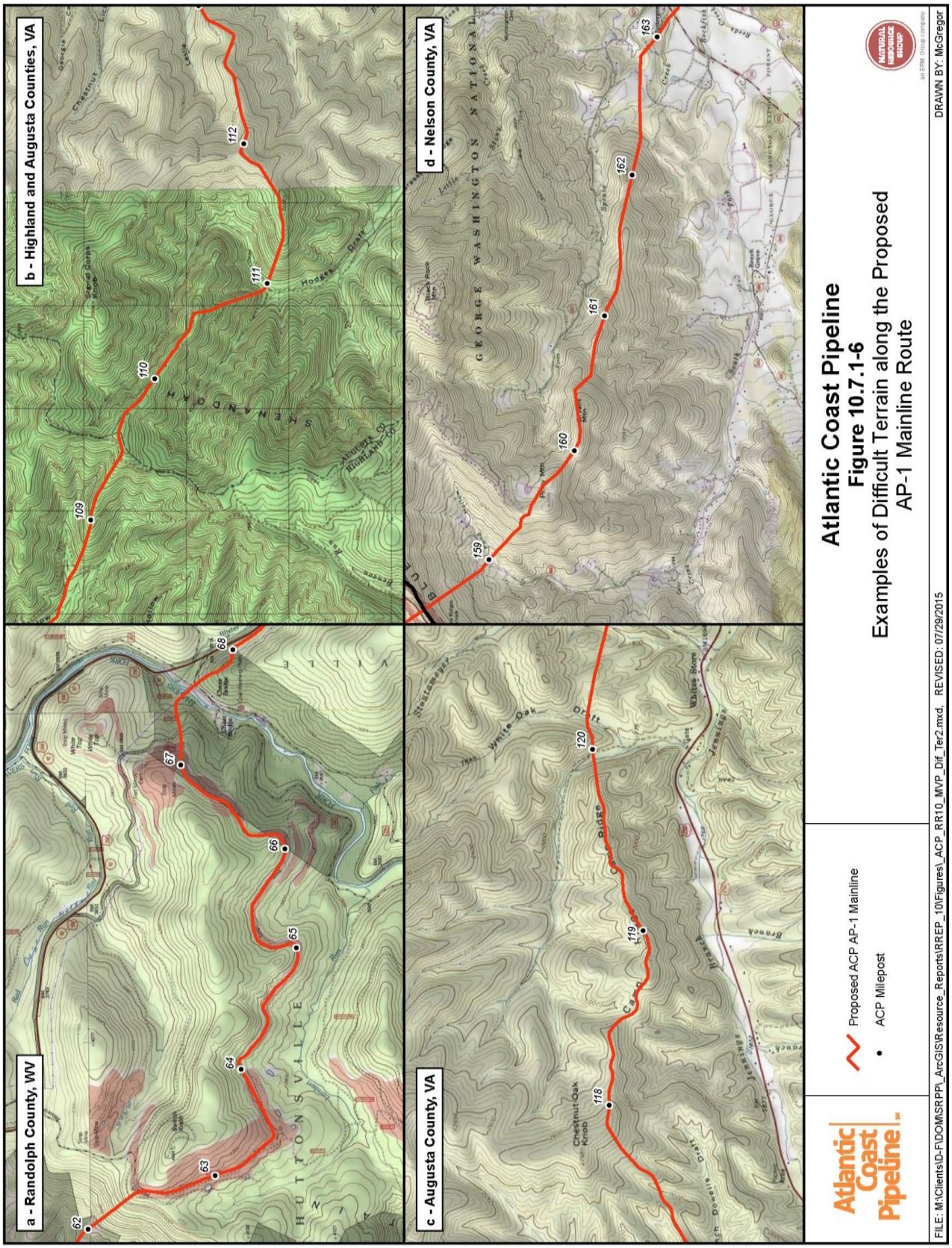
Pocahontas, and Highland Counties, West Virginia, and Highland, Augusta, Nelson, and Buckingham Counties, Virginia, where it would interconnect with Transco's existing pipeline system. From this point, the proposed AP-1 mainline would continue along its currently proposed route into central and southeastern Virginia.

The Option 2 scenario, if technically feasible, would result in greater collocation with other linear corridor facilities for the ACP and MVP projects (up to about 191 miles, assuming both pipelines are permitted and built). Routing both pipelines along the current AP-1 alignment would increase the length of the MVP pipeline by only 4 miles, but it would result in significantly greater cumulative impact in the MNF and GWNF. Additionally, while the terrain along the currently proposed AP-1 mainline route provides better opportunities than the MVP route for collocating the ACP and MVP pipelines in a common corridor, there are crossings of steep mountains and ridges where it would not be feasible to install two large diameter pipelines on the same landform, including areas in the MNF and GWNF (see Figure 10.7.1-6).

Examples of difficult terrain include:

- the crossing of a former strip mine between approximate MPs 18 and 22 in Lewis and Upshur Counties, West Virginia;
- the crossing of Cheat and Back Allegheny Mountains within the MNF between MPs 62 and 67 in Randolph County, West Virginia (see Figure 10.7.1-6a);
- the crossing of the Shenandoah Mountain range within the GWNF between MPs 109 and 113 in Highland and Augusta Counties, Virginia (see Figure 10.7.1-6b);
- the crossing of Chestnut Oak Knob and Camp Ridge within the GWNF between MPs 117 and 120 in Augusta County, Virginia (see Figure 10.7.1-6c);
- the crossing of the Blue Ridge Mountains (including USFS lands along the Blue Ridge Parkway and Appalachian National Scenic Trail (Appalachian Trail)), Piney Mountain, and Bryant Mountain between MPs 157 and 123 in Nelson and Augusta Counties, Virginia (see Figure 10.7.1-6d); and
- the crossings of Thoroughfare Gap and Bailey Mountain between MPs 172 and 175 in Nelson County, Virginia.

Although segments of the two pipelines could be constructed within a common corridor, new individual rights-of-way for both pipelines would be necessary in the areas with steep, difficult terrain. This would result in additional crossings of Federal lands in the MNF and GWNF, as well as separate crossings of Federal lands at the Appalachian Trail and the Blue Ridge Parkway. For these reasons, the Option 2 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as currently proposed.


a - Randolph County, WV
b - Highland and Augusta Counties, VA
c - Augusta County, VA
d - Nelson County, VA
Proposed ACP AP-1 Mainline
ACP Milepost
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.7.1-6
Examples of Difficult Terrain along the Proposed AP-1 Mainline Route
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Option 3

Under the Option 3 scenario, the ACP and MVP pipelines would be routed in a common, intermediate corridor relative to the currently proposed routes. Atlantic and DTI attempted to identify a potential new corridor extending south/southeast of the proposed Marts Junction Interconnection in Harrison County, West Virginia, to the existing Transco pipeline system in southern Virginia along terrain with sufficient space for the installation of two adjacent pipelines. As with the Option 1 and 2 scenarios, the terrain in much of this area consists of mountaintops and ridges with narrow crests and steep side slopes with insufficient space for two pipelines.

In addition to the difficult terrain, the area between the currently proposed ACP and MVP pipelines in Virginia includes extensive Federal landholdings in the MNF, GWNF, and JNF, including sensitive features and specially protected and managed lands which would be difficult to cross. These include designated Wilderness Areas, potential Wilderness Areas, roadless areas, backcountry recreation areas, special biological areas, and scenic corridors (see Figure 10.7.1-7). As noted above, crossings of Wilderness Areas would require an authorization from the President or Congress. If such authorization could be obtained at all, it would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. Atlantic and DTI were unable to locate routes that both avoid these features and cross terrain suitable for construction of two large diameter pipelines in a common corridor. For these reasons, the Option 3 scenario is not considered a viable or feasible alternative to the ACP and MVP projects as currently proposed.

Single Pipeline Option

Atlantic assessed the potential to transport the combined capacity of the proposed ACP and MVP projects in a single pipeline along the proposed route for the AP-1 mainline between Compressor Station 1 and Compressor Station 2 (approximately 180 miles). For purposes of this analysis, Atlantic assumed a total service obligation of 3.5 billion standard cubic feet per day (bcf/d) for both projects. [10]

Three scenarios were considered for this assessment:

1. utilizing a maximum allowable operating pressure (MAOP) of 1,440 pounds per square inch gauge (psig) [11] with additional compression;

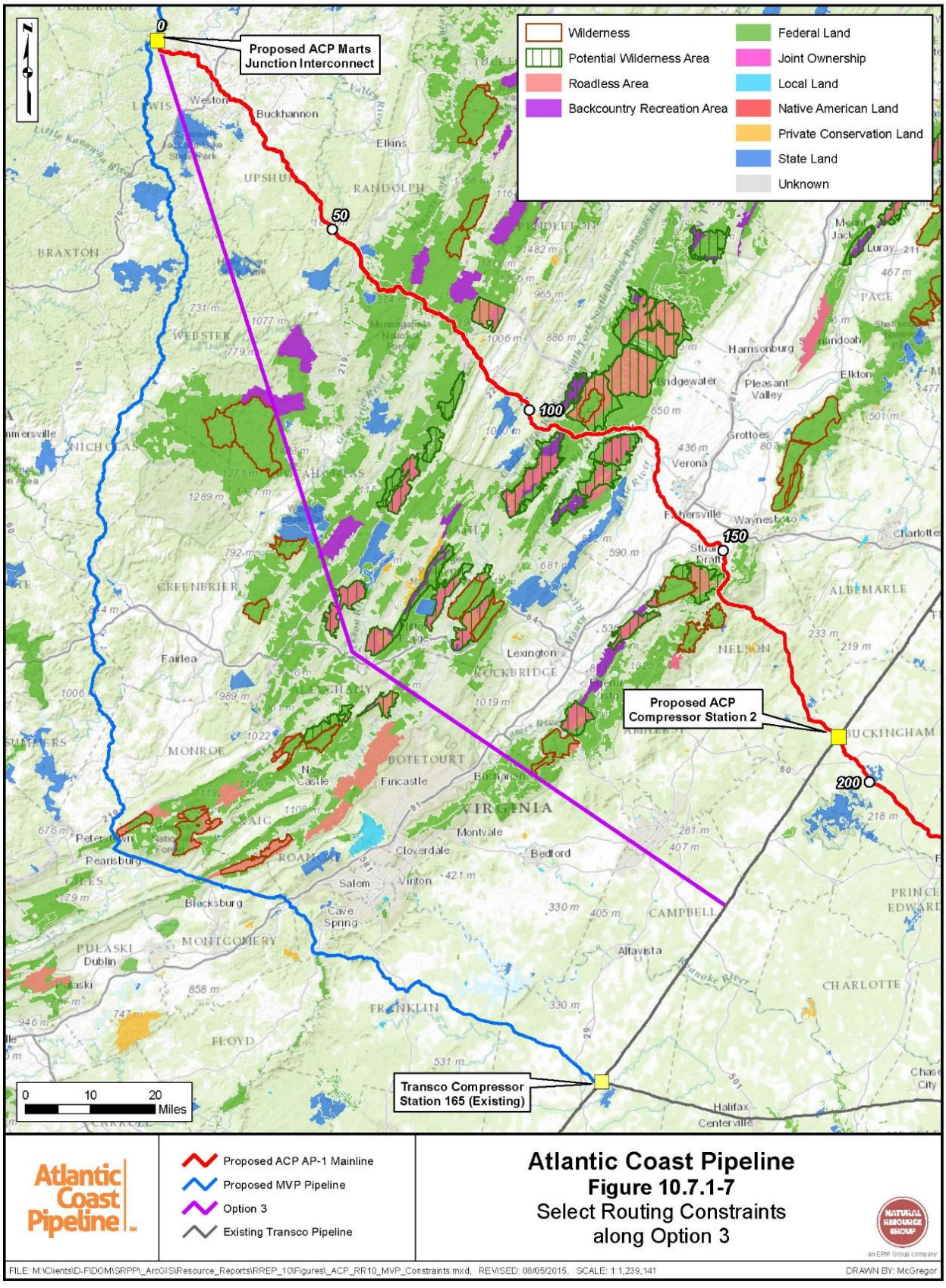
2. utilizing a MAOP of 2,075 psig; and [12]

3. utilizing a larger diameter pipe (i.e., 48-inch outside diameter pipe).

[10] Atlantic has considered 3.5 bcf/d as approximately equivalent to 3.5 million dekatherms per day (MMDth/d) for this analysis. Note that this calculation reflects the overall design capacity set forth in the MVP application, and not the particular requirements of MVP project customers. Atlantic is not aware of the MVP customer receipt or delivery point specifications.

[11] The 1,440 psig is the currently proposed MAOP for the ACP.

[12] The MAOP of the pipeline that is being proposed in Alaska is 2,075 psig.


Proposed ACP Marts Junction Interconnect
Proposed ACP Compressor Station 2
Transco Compressor Station 165 (Existing)
0
50
100
150
200
Wilderness
Potential Wilderness Area
Roadless Area
Backcountry Recreation Area
Federal Land
Joint Ownership
Local Land
Native American Land
Private Conservation Land
State Land
Unknown
Proposed ACP AP-1 Mainline
Proposed MVP Pipeline
Option 3
Existing Transco Pipeline
0 10 20 Miles
Atlantic Coast Pipeline
Figure 10.7.1-7
Select Routing Constraints along Option 3
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_MVP_Constraints.mxd, REVISED: 08/05/2015, SCALE: 1:1,239,141
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Scenario 1

The ACP design includes a total of 117,545 horsepower (hp) of compression at three compressor stations. According to MVP's draft Resource Reports, the proposed MVP project includes a combined 171,600 hp of compression at three compressor stations.[13] Therefore, the ACP and MVP projects represent a combined total of 334,745 hp of compression at seven new compressor stations.

To meet the combined requirements of the two projects while utilizing a MAOP of 1,440 psig, Atlantic would need to install an additional approximately 420,000 hp of compression. In order to provide appropriate pressure and velocity control for this substantial volume of natural gas through a single pipeline system, Atlantic would need to install 11 additional compressor stations, located approximately every 15 miles, between Compressor Stations 1 and 2, resulting in a total of 537,545 hp of compression on the system. In addition, Atlantic estimates that approximately 46 miles of 42- inch pipeline and another 137,000 hp of compression would be required to deliver the MVP volumes from Wetzel County, West Virginia, into the ACP system at the discharge side of Compressor Station 1.

Scenario 1 would more than double the number of greenfield compressor stations compared with the two separate projects (i.e., 17 versus 6) and increase the total compression by almost 133 percent (674,545 hp versus 289,145 hp). It would also require another 46 miles of 42-inch pipeline upstream of Compressor Station 1.

The ACP, as proposed, is designed to operate at a MAOP of 1,440 psig, which will provide for the operational flexibility needed for potential hourly flow variations and line pack [14] (including the line pack needed to provide the pack account provisions that Atlantic is contractually obligated to provide to its Foundation and Anchor shippers). The ACP will be internally coated, per Atlantic's current design, which reduces the pressure losses through the pipeline system to increase volumetric efficiency. Using Scenario 1, the flowrates and pressure that would be required under this single pipeline option for the combined ACP and MVP volumes could constrain operational flexibility and hinder Atlantic's ability to meet its existing contractual obligations (as noted above).

For all these reasons, the single pipeline option for the ACP and MVP is not a viable or feasible alternative to the ACP as proposed.

Scenario 2

Atlantic and DTI note that several applicants are proposing to build a new 42-inch diameter natural gas pipeline in Alaska that will be capable of delivering 3.5 bcf/d of natural gas (i.e., equivalent to the combined delivery volume of the ACP and MVP projects). This pipeline

[13] Mountain Valley Pipeline LLC, Docket No. PF15-3-000. Resource Report 2 – Water Use and Quality, Draft, May 2015, at p. 2-1 (filed May 22, 2015, FERC Accession Number 20150522-5420). Compression and number of compressor stations has been revised per ACP FERC DR #154 to match MVPs current design.

[14] Natural gas is transported in a gaseous state and can be compressed; thereby temporarily "packing" more gas into the pipeline.

is proposed to operate with a MAOP of 2,075 psig. According to the Interstate Natural Gas Association of America (INGAA), "natural gas interstate transmission systems operate at pressures on the order of 500 to 1,800 pounds per square inch." [15] Even though interstate natural gas pipelines typically operate at pressures lower than 2,075 psig, Atlantic evaluated utilizing a single pipeline with a MAOP of 2,075 psig to transport the combined capacity of the proposed ACP and MVP projects for Scenario 2. Atlantic assessed the requirements needed to sustain the higher pressure of 2,075 psig (versus the current design MAOP of 1,440 psig), by evaluating (1) increasing the wall thickness of the pipe and (2) changing the grade of steel [16] used for the pipe.

Assuming the use of an X-70 grade of steel (i.e., the current grade of pipe proposed for ACP), a 2,075 psig MAOP on a 42-inch outside diameter pipe would require a 44 percent increase in the wall thickness of the pipe for Class 1, 2, and 3 pipe. Therefore, under these circumstances, the pipe would weigh approximately 43 percent more than the proposed pipe for ACP. This additional weight would require the utilization of larger/heavier and more equipment (e.g., side booms and winch tractors) to handle and lay the pipe, which would present safety concerns during construction. Specifically, mountain terrain and steep hills would require the utilization of winches to support the pipe laying equipment. Pipe laying operations that could have been conducted by approximately 580 side booms would require approximately 590 side booms which are limited in availability in the U.S. market. The additional weight of the pipe and the associated equipment to handle it also raises concerns regarding the potential for damage to public roads from the additional number of trucks required to haul the pipe (i.e., a truck cannot haul as many joints of the heavier pipe) and the heavier equipment.

Finally, the additional pipe wall thickness and the stiffness of Class 2 and 3 pipe would limit the maximum degree of bend which would make construction in rugged terrain less productive and likely impractical without the use of weld fittings. For example, assuming an average of 10 degrees of bend per joint for the pipe as currently designed for the ACP, the additional pipe wall thickness and stiffness needed for the combined volumes of the ACP and MVP, would only allow for an average on the order of 7 degrees of bend per joint. The duration of construction would also increase due to slower productivity to weld the thicker wall pipe and to lower- and tie-in the heavier wall pipe.

A change in the grade of the steel used for the pipe (from the current X-70 to X-80) would limit the increase in the wall thickness required to operate a pipeline with a MAOP of 2,075 psig. Atlantic estimates the pipe would weigh approximately 26 percent more than the pipe currently proposed for ACP, raising the concerns discussed above regarding additional weight of the pipe. Mechanized welding would be needed for this grade of pipe, as stick electrodes would not produce the weld strength required. It is impractical to utilize mechanized welding in mountainous areas since the equipment needed to complete the welds is not suitable for traveling in rugged, steep terrain as well as not efficient due to the lack of space. The lack of availability of X-80 pipe is also a concern.

[15] The Interstate Natural Gas Transmission System: Scale, Physical Complexity and Business Model accessible at: http://www.ingaa.org/file.aspx?id=10751.

[16] The grade of the steel of the pipe refers to the tensile strength of the pipe.

Scenario 3

Atlantic also evaluated utilizing a 48-inch outside diameter pipe instead of 42-inch outside diameter pipe to flow the 3.5 Bcf/d between Compressor Station 1 and Compressor Station 2. In addition to the increased weight challenges (i.e., the 48-inch diameter pipe is 87 percent heavier than the current 42-inch design), the larger diameter pipeline would have reduced bending capabilities, making the construction in the rugged terrain much more difficult and possibly impractical without utilization of large quantities of weld fittings (as described in Scenario 2). Atlantic also estimates this scenario would require the construction right-of-way to be increased to approximately 150 feet. The wider construction right-of-way required for the larger diameter pipe would increase the environmental disturbance area of the Project by about 545 acres. Although this scenario would require less compression than Scenario 1 (427,530 hp for Scenario 3 versus 674,545 hp for Scenario 1), it would still result in nearly a 48 percent increase of compression above the ACP and MVP projects combined total of 289,145 hp.

Summary

In summary, a single pipeline option utilizing the more practical 1,440 psig MAOP, as described in Scenario 1, would more than double the number of greenfield compressor stations compared with the two projects as designed separately and more than double the total compression. The use of a higher MAOP of 2,075 psig (Scenario 2) or a 48-inch outside diameter pipe single pipeline system (Scenario 3) would raise many concerns relating to the constructability and availability of material and equipment as well as other concerns and challenges listed above.

A single pipeline option along the MVP route would encounter the same limiting technological and hydraulic factors as the single pipeline option along the AP-1 mainline route. Therefore, a single pipeline option along the MVP route is also not considered a viable or feasible alternative to the ACP.

10.7.1.3 Appalachian Connector Pipeline

As discussed in Section 10.6.2.3 above, Transco has announced plans to construct the Appalachian Connector Pipeline Project, approximately 300 miles of new pipeline between the existing Rockies Express pipeline in Monroe County, Ohio; an existing gas processing facility in Marshall County, West Virginia; and the existing Transco mainline in Pittsylvania County, Virginia (Transco's existing Compressor Station 165). The project would be similar to (and compete with) MVP and have the same primary delivery point.

According to the project website, the Appalachian Connector Pipeline Project is in the preliminary planning stages and a route has not been proposed (see Figure 10.6-1) (Williams Partners, LP, 2015). However, general location maps available in media reports and from various stakeholder websites suggest that the route would be similar to MVP (see Figure 10.7.1-3) (Williams Partners, LP, 2015). Assuming that is the case, this route would have the same limitations relative to the ACP as described above for MVP. A conceptual alternative route along either MVP or the Appalachian Connector Pipeline would add 68 miles to the length of the AP-1 mainline to access Atlantic's proposed delivery/receipt points in southeastern

Virginia. This would significantly increase the length of the pipeline, the area of environmental impact, and the cost of the ACP. Additionally, as described above for the MVP, it would not be feasible to route the Appalachian Connector Pipeline and AP-1 mainline in a common corridor similar to the MVP route due to difficult terrain.

For all these reasons, a conceptual alternative route along a similar path as the Appalachian Connector Pipeline provides no advantage over the ACP and is not a viable or feasible alternative route.

10.7.2 Adjacent to Existing Electric Transmission Lines

Relative to another pipeline, there are additional challenges to routing a new natural gas transmission pipeline adjacent to an existing electric transmission line, particularly with regard to terrain. Whereas electric transmission lines can be sited to span steep or difficult topographic features, such as ravines, valleys, and side slopes, pipeline construction in rugged areas must typically cross ridges and hills perpendicular to the slope (i.e., along the natural fall of the slope). For this reason, electric transmission lines can often be built in topographies where pipeline construction would be difficult or impractical.

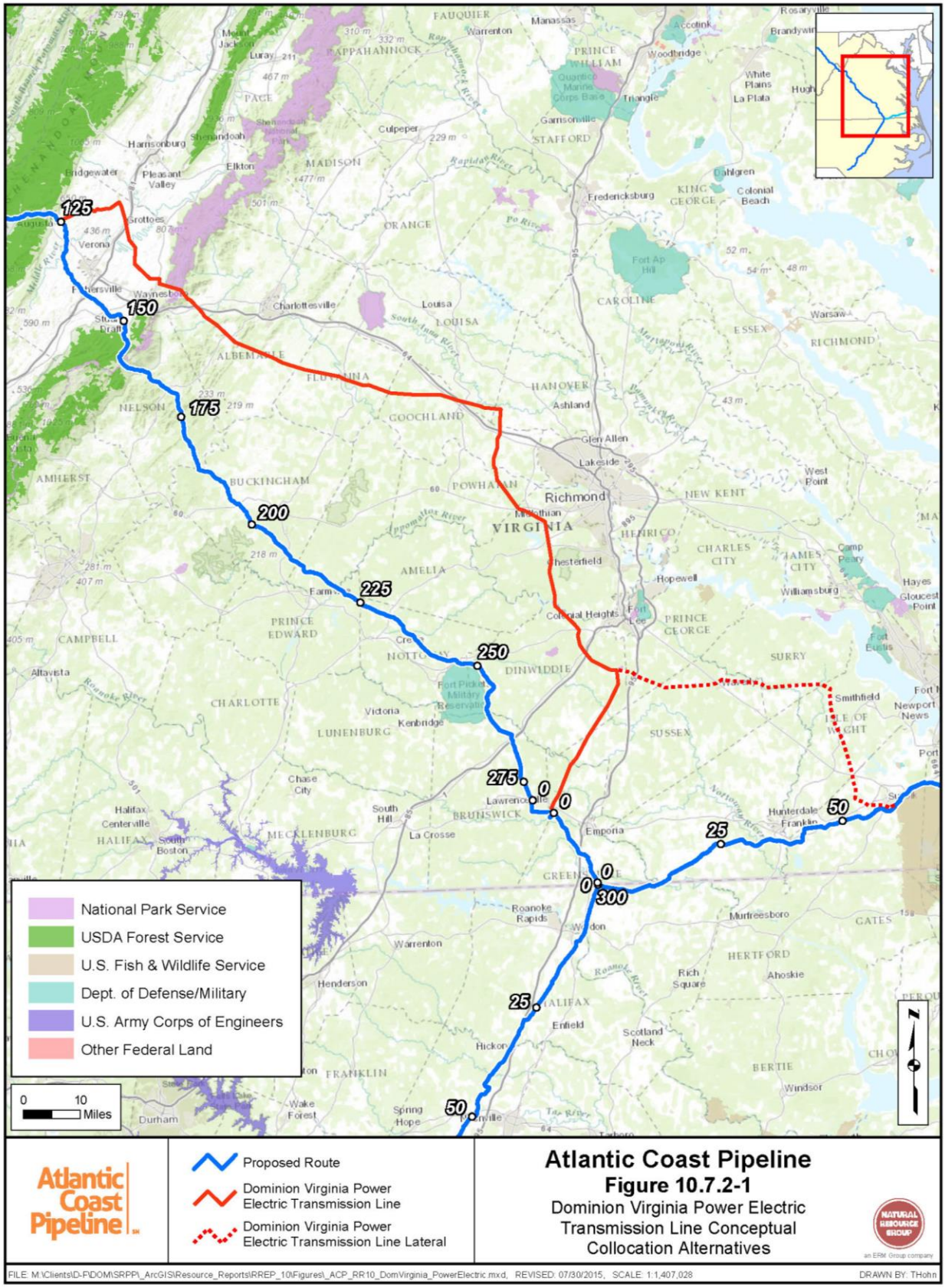
Another issue with electric transmission lines is that tower structures and wires, especially for high voltage lines, typically require a wide operational right-of-way for safety and reliability. Depending on the operational requirements of the existing electric transmission system, a new pipeline might need to be offset from the transmission line, which could reduce some of the benefits of collocation, such as less tree clearing.

Atlantic evaluated a conceptual alternative route that follows a Dominion Virginia Power (DVP) 500 kilovolt (kV) electric transmission line across central and southern Virginia. Additionally, Atlantic and DTI evaluated a conceptual alternative route which follows several existing electric transmission lines, including lines operated by Monongahela Power Company (MPC), West Penn Power (West Penn), and DVP. [17]

10.7.2.1 Dominion Virginia Power Electric Transmission Line

Beginning approximately at MP 125 of the proposed AP-1 mainline in Augusta County, Virginia, a conceptual alternative route adjacent to DVP would initially head due east for approximately 12 miles. The route would then turn to the south and southeast for approximately 84 miles, crossing Augusta, Albemarle, Fluvanna, Goochland, Louisa, and Hanover Counties, Virginia. At a point near Vontay, Virginia, the route would turn south and continue for approximately 57 miles across Hanover, Goochland, Powhatan, Chesterfield, and Dinwiddie Counties, Virginia, passing west of the City of Richmond. The route would then head south for approximately 27 miles across Dinwiddie, Sussex, and Greensville Counties, Virginia, terminating approximately at MP 284 of the proposed AP-1 mainline (see Figure 10.7.2-1).

[17] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to existing electric transmission lines, including DVP's existing 500 kV electric transmission line.


125
150
175
200
225
250
275
0
0
0
0
300
25
25
50
50
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 Miles
Proposed Route
Dominion Virginia Power Electric Transmission Line
Dominion Virginia Power Electric Transmission Line Lateral
Atlantic Coast Pipeline
Figure 10.7.2-1
Dominion Virginia Power Electric Transmission Line Conceptual Collocation Alternatives
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_DomVirginia_PowerElectric.mxd, REVISED: 07/30/2015, SCALE: 1:1,407,028
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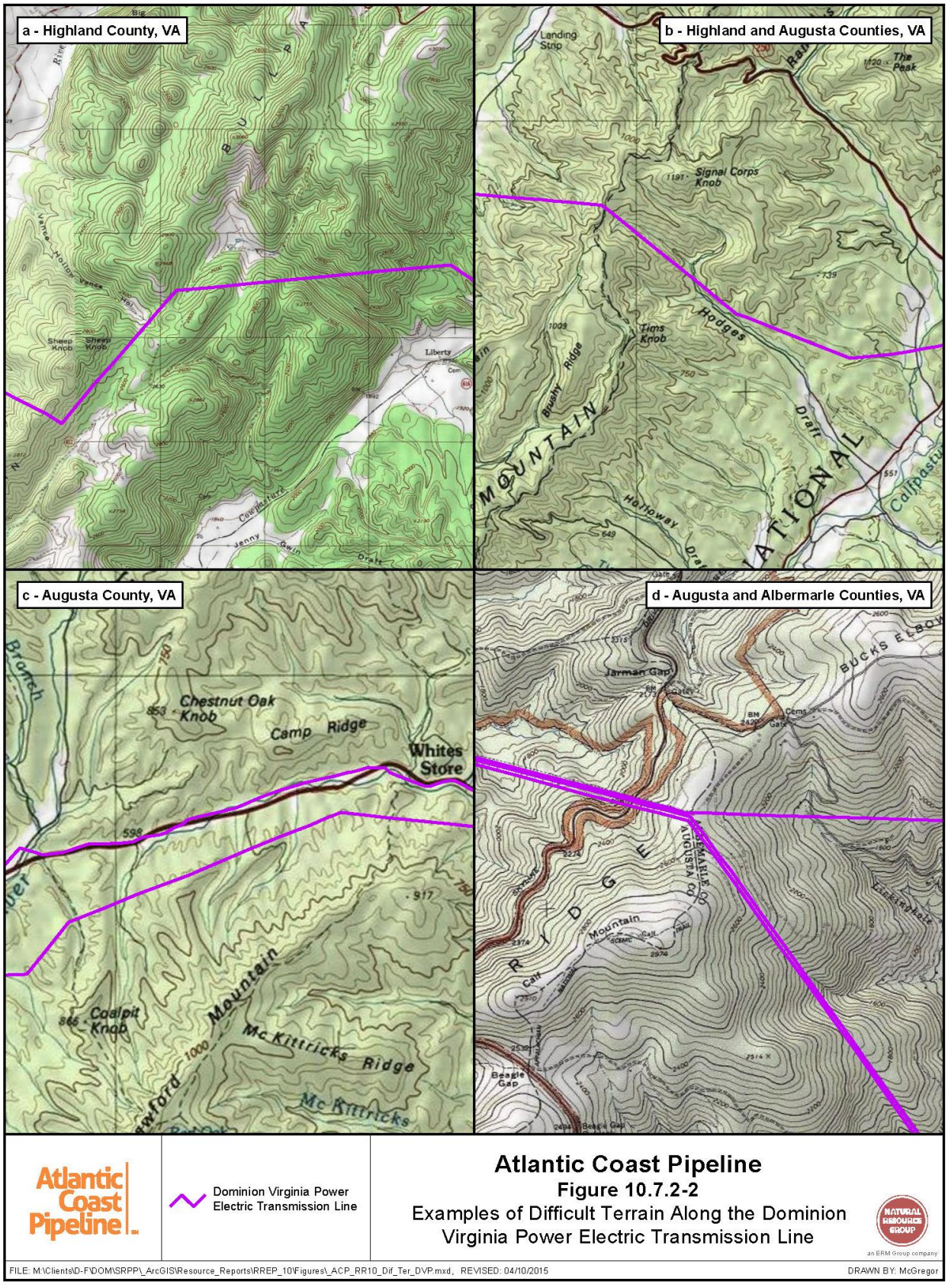
In addition to the AP-1 alternative, an alternate route for the proposed AP-3 lateral would also be required. Starting at a point near Reams, Virginia, the alternate lateral route would follow an existing DVP 500 kV transmission line for approximately 37 miles to the east, crossing Dinwiddie, Prince George, Sussex, and Surry Counties, Virginia. It would then head south for approximately 29 miles across Isle of Wight County and the City of Suffolk, Virginia, terminating approximately at MP 61 of the proposed AP-3 lateral (see Figure 10.7.2-1).

Relative to the corresponding segments of the proposed AP-1 mainline and AP-3 lateral, the conceptual route alternative adjacent to DVP would add a total of approximately 26 miles to the length of the proposed pipelines, which would increase the environmental impact and cost of the Project. The additional length of the pipelines would increase the area of impact for the ACP by a minimum of 363 acres and encumber an additional 221 acres in the permanent, maintained easement for the pipelines. [18]

In addition to these factors, there are topographic and land use constraints along the conceptual route alternative which preclude placing the AP-1 and AP-3 pipelines adjacent to DVP. About 50 miles of the mainline route across Augusta, Albemarle, Fluvanna, and Goochland Counties crosses terrain with side slope. While the pipeline could be placed adjacent to the existing electric transmission line in places along this segment of the route, there would be other places where the pipeline would need to follow an alternate parallel alignment to avoid side slope terrain. This is particularly true where the route crosses the Blue Ridge Mountains in Augusta and Albemarle Counties, Virginia, and in the foothills on the east side of the mountains (see Figure 10.7.2-2).

Land use constraints along the existing DVP corridor include a 0.2-mile-long crossing of NPS lands in the SNP in Augusta and Nelson Counties, Virginia, near Calf Mountain. Currently, there is no general authority available to the NPS to approve rights-of-way for natural gas pipelines across NPS lands (other than the Blue Ridge Parkway). Instead, park-specific legislation enacted by the Congress and signed into law by the President is required to authorize the NPS to consider, review, analyze, and approve the construction of a natural gas pipeline crossing of NPS-managed lands. Based on recent Congressional action of the time required to secure the passage of legislation authorizing the NPS to consider individual natural gas pipeline crossings, there is no evidence to suggest that legislation could be enacted and the NPS analysis completed to issue a right-of-way grant to meet the Projects' purpose and need. The Projects' in-service date of November 2018 would not be met and the delivery of natural gas for power generation, which is the intended use for approximately 79 percent of the gas delivered by Atlantic, would not occur within the timeframe required to contribute to Virginia's and North Carolina's Clean Power Plan compliance obligations. An alternative greenfield route would be necessary to avoid the SNP.

[18] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the AP-3 lateral. The conceptual AP-1 mainline adjacent to DVP would result in an additional 318 acres of construction right-of-way and 191 acres of permanent easement. The conceptual route for the AP-3 lateral would result in an additional 45 acres of construction right-of-way and 30 acres of permanent easement.


a - Highland County, VA
b - Highland and Augusta Counties, VA
c - Augusta County, VA
d - Augusta and Albermarle Counties, VA
Chestnut Oak Knob
Camp Ridge
Whites Store
Coalpit Knob
Mc Kittricks Ridge
Signal Corps Knob
Hodges
Tims Knob
Brushy Ridge
Jarman Gap
Beagle Gap
Dominion Virginia Power Electric Transmission Line
Atlantic Coast Pipeline
Figure 10.7.2-2
Examples of Difficult Terrain Along the Dominion Virginia Power Electric Transmission Line
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A greenfield route to the south would need to pass south of Waynesboro, which would approximate the current AP-1 mainline route. An alternate route to the north would need to pass north of Front Royal, Virginia. Depending on the route selected, this would add up to 80 miles of pipeline to the conceptual route alternative (an additional 1,212 acres of construction right-of-way and 727 acres of permanent easement), which would increase the area of environmental impact and cost of the ACP.

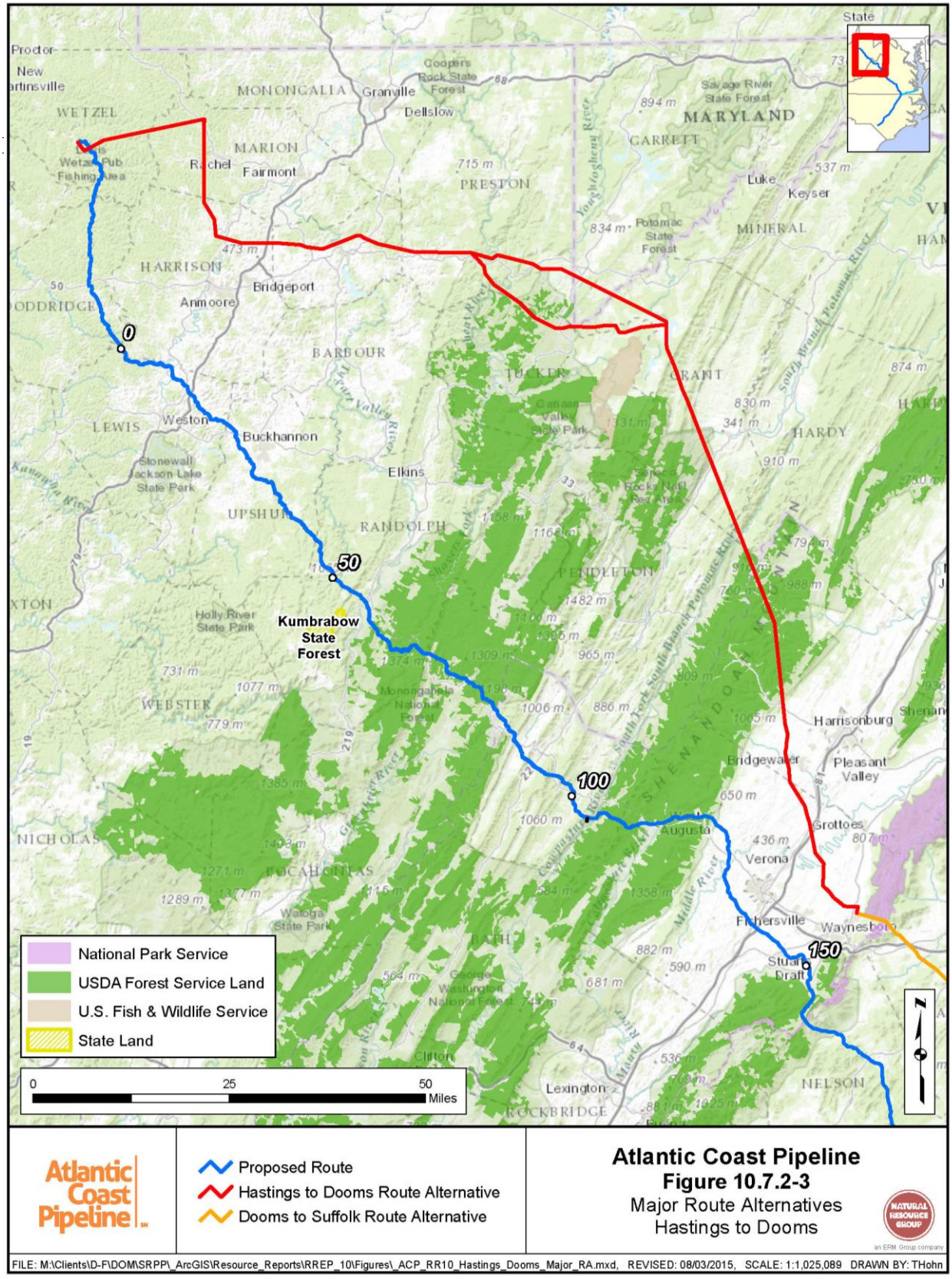
The crossing of the SNP aside, there are many places along the existing DVP corridor where residential developments have encroached on the existing right-of-way. In these areas, the proposed pipelines would need to be routed away from the existing corridor, which would increase the length of the pipeline, the area of environmental impact, and the cost, as well as forgo the benefits of collocation. One area, in particular, where a major alternative route off the existing DVP corridor would be required is Midlothian in Chesterfield County, Virginia, on the outskirts of the City of Richmond. A greenfield route alternative measuring approximately 20 to 25 miles in length would be necessary to avoid developments in and around Midlothian. Another developed area along the route occurs in the City of Suffolk. A greenfield route alternative measuring approximately 10 miles in length would be necessary to avoid high density residential subdivisions on the east side of Suffolk. Depending on the routes selected, these two route alternatives alone would add between approximately 10 and 15 miles of additional pipeline to the conceptual route.

For all the reasons described above, a conceptual route alternative adjacent to DVP would greatly increase the length of the pipelines, the area of environmental impact, and the cost of the ACP. Moreover, significant greenfield route alternatives would be required to avoid difficult side slope terrain or land use features, including a crossing of the SNP. Therefore, the conceptual route alternative along the DVP corridor is not a viable or feasible alternative to the ACP.

10.7.2.2 Multiple Electric Transmission Lines

As noted above, Atlantic and DTI evaluated a conceptual route alternative that parallels portions of various existing electric transmission lines across West Virginia, Virginia, and North Carolina. For purposes of this analysis, the conceptual route alternative was divided into three segments: Hastings to Dooms, Dooms to Suffolk, and Pleasant Shade to St. Pauls. Each of these segments is described below.

The first segment of the conceptual route alternative, Hastings to Dooms, would originate at DTI's existing Mockingbird Hill Compressor Station (i.e., approximately at MP 33.6 of the proposed TL-635 loop) near Hastings in Wetzel County, West Virginia (see Figure 10.7.2-3). Even though the alternative route would originate at this point, approximately 33 miles of new pipeline loop would still be required for the SHP because of receipt obligations south of the Mockingbird Hill Compressor Station. Rather than 30-inch diameter pipe, which is proposed for the TL-635 loop, the new pipeline would consist of about 17 miles of 24-inch diameter pipeline and 16 miles of 20-inch diameter pipeline. For these reasons, the Hastings to Dooms segment includes the proposed TL-635 loop as a component of the conceptual route alternative.


State
Proctor
New
MONONGALIA
Granville
Coopers Rock State Forest
Dellslow
WETZEL
MARION
Rachel
Fairmont
PRESTON
MARYLAND
GARRETT
Savage River State Forest
Luke
Keyser
MINERAL
Potomac State Forest
HARRISON
Bridgeport
Anmoore
0
BARBOUR
TUCKER
GRANT
HARDY
LEWIS
Weston
Buckhannon
Stonewall Jackson Lake State Park
Elkins
Canaan Valley State Park
Dolly Sods Wilderness
UPSHUR
RANDOLPH
50
PENDLETON
Holly River State Park
Kumbrabow State Forest
WEBSTER
Monongahela National Forest
Harrisonburg
Bridgewater
Pleasant Valley
100
Augusta
Grottoes
Verona
NICHOLAS
POCAHONTAS
Watoga State Park
Fishersville
Waynesboro
150
Stuarts Draft
Clifton
Lexington
ROCKBRIDGE
NELSON
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
State Land
0
25
50
Miles
Atlantic Coast Pipeline
Proposed Route
Hastings to Dooms Route Alternative
Dooms to Suffolk Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-3
Major Route Alternatives
Hastings to Dooms
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Hastings_Dooms_Major_RA.mxd, REVISED: 08/03/2015, SCALE: 1:1,025,089 DRAWN BY: THohn

Collectively, the three segments of the conceptual route alternative could increase the length of the Projects by over 100 miles. This would increase the area of environmental impact and cost of the Projects and could require additional compression on the system. For these reasons, and as discussed in detail below, the conceptual route alternative is not a viable or feasible alternative to the Projects.

Hastings to Dooms

Starting at the Mockingbird Hill Compressor Station, the Hastings to Dooms route alternative initially would follow an existing MPC 138 kV electric transmission line for approximately 17 miles to the east/northeast to a point near Metz in Marion County, West Virginia. It would then follow an existing West Penn 500 kV electric transmission line to the south for about 15 miles across Marion and Harrison Counties, West Virginia, to a point near Lumberport. The route would then follow an existing 500 kV electric transmission line (operator unknown) to the east for approximately 34 miles crossing Harrison, Taylor, and Preston Counties, West Virginia. This segment of the route generally is on the north side of U.S. Highway 50.

At a point west of Rowlesburg, West Virginia, the existing 500 kV electric transmission line splits into two corridors. The northern corridor continues to the east for 28 miles across Preston County, West Virginia, Garrett County, Maryland, and Grant County, West Virginia. The southern route heads east/southeast for about 30 miles across Preston, Tucker, and Grant Counties, West Virginia. The two routes merge at an existing power station just west of Mount Storm Lake in Grant County, West Virginia. Either corridor could potentially be followed for the conceptual route alternative.

From the power station at Mount Storm Lake, the conceptual route alternative follows an existing MPC 500 kV electric transmission line for about 64 miles to the south/southeast across Grant, Hardy, and Pendleton Counties, West Virginia and Rockingham and Augusta Counties, Virginia. It then follows an existing DVP 500 kV electric transmission line to the south/southeast for about 18 miles across Augusta County. It terminates at an existing substation near Dooms in Augusta County, just north of the City of Waynesboro, Virginia.

Regardless of the alignment selected for the route segment between Rowlesburg and Mount Storm Lake, the Hastings to Dooms conceptual route alternative would measure about 176 miles in length, plus the 33 miles of the TL-635 pipeline loop, for a total of 209 miles. Although the conceptual route alternative is mostly adjacent to existing utilities, this is approximately 27 miles longer than the corresponding segments of the ACP and SHP (a total of about 182 miles consisting of 33 miles on the TL-635 loop and 149 miles on the AP-1 mainline). The increase in length would result in an additional 409 acres of construction right-of-way and 245 acres of permanent easement, which would increase the environmental impact and costs of the Projects. [19]

[19] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.

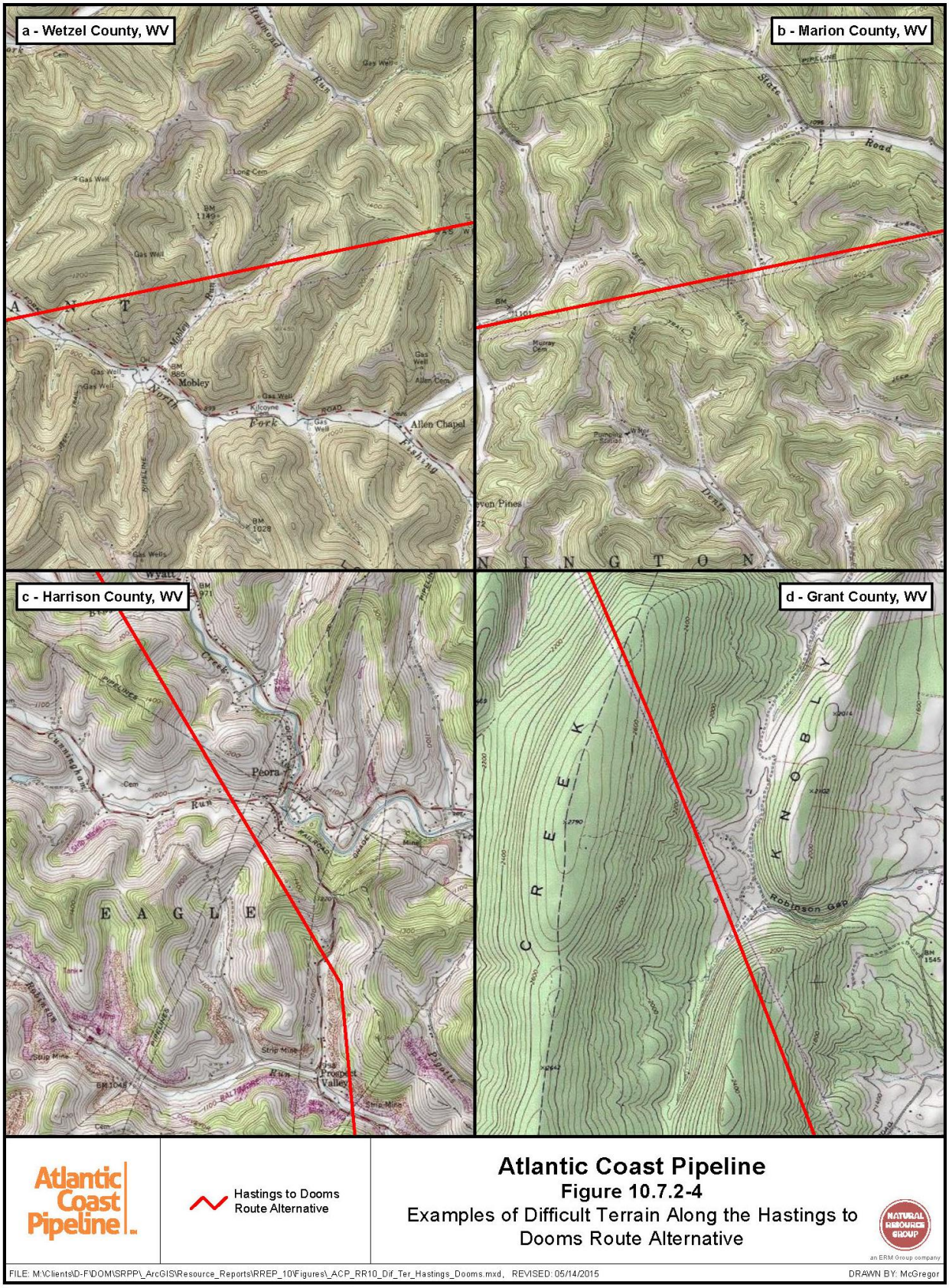
Topography along much of the conceptual route alternative would preclude placing the pipeline adjacent to the existing electric transmission lines due to difficult terrain. Much of the route between Hastings and Mount Storm Lake in West Virginia, a linear distance of about 90 miles, crosses steep side slope. The pipeline could be placed adjacent to the existing electric transmission lines for short distances along this segment of the route, but for much of this area the pipeline would need to be routed on an alternate path to cross ridges perpendicular to the slope (i.e., along the natural fall of the slope). Examples of difficult terrain along the existing electric transmission lines are depicted in Figure 10.7.2-4.

South of Mount Storm Lake, there are better opportunities to place the pipeline adjacent to the existing electric transmission lines, but there are still places where the existing facilities cross steep side slope which would need to be avoided by the pipeline. These include Allegheny Front, New Creek Mountain, and Middle Mountain in Grant County, West Virginia; and Shenandoah Mountain and surrounding peaks and Second Mountain and surrounding peaks in Rockingham County, Virginia. In these areas, the pipeline would need to be routed along an alternate path to avoid the side slope.

The new routing required to avoid side slope would result in an alternate route that is generally parallel, but not adjacent, to the existing electric transmission lines. In many places, the pipeline would need to be routed on adjacent ridges, which would increase the length of the pipeline and forgo the benefits of collocation, such as reduced forest fragmentation. Atlantic and DTI estimate that the additional routing required to avoid side slope would increase the length of the pipeline by about 10 percent, excluding the TL-635 loop. This would increase the length of the conceptual route alternative approximately by 21 miles, for a total length of about 230 miles, which is significantly longer than the baseline (182 miles). This would require an additional 318 acres of construction right-of-way and 191 acres of permanent easement relative to the baseline.

In addition to the difficult terrain, there are developed areas along the conceptual route alternative which would need to be avoided by the pipeline. These include the Haywood/ Lumberport area in Harrison County, West Virginia; the area along State Road 28/55 in Grant County, West Virginia; Lilly in Rockingham County, Virginia; and Dooms in Augusta County, Virginia. In these places, residences and other buildings have built up adjacent to the existing electric transmission line. Alternate routes to avoid these areas would increase the length, environmental impact, and cost of the Projects even further.

While the Hastings to Dooms segment avoids the MNF, it crosses about 16.7 miles of the GWNF (compared to 11.8 miles for the ACP) in Pendleton County, West Virginia and Rockingham County, Virginia. This crossing occurs adjacent to the existing MPC 500 kV electric transmission line within a designated utility corridor on the GWNF. The terrain along much of the corridor, however, is unsuitable for pipeline construction. The area includes the crossing of Shenandoah Mountain, which as noted above, is characterized by areas of steep side slope. Alternate routing to avoid the side slope would result in a new corridor across the GWNF in this area.


a - Wetzel County, WV
b - Marion County, WV
c - Harrison County, WV
d - Grant County, WV
Mobley
Allen Chapel
Peora
Prospect Valley
Robinson Gap
Hastings to Dooms Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-4
Examples of Difficult Terrain Along the Hastings to Dooms Route Alternative
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DRAWN BY: McGregor

For all the reasons described above, the Hastings to Dooms segment of the conceptual route alternative would greatly increase the length, area of environmental impact, and cost of the Projects. Significant greenfield route alternatives would be necessary to avoid difficult side slope terrain and developed areas along the route. Therefore, the Hastings to Dooms segment of the conceptual route alternative is not a viable or feasible alternative to the Projects.

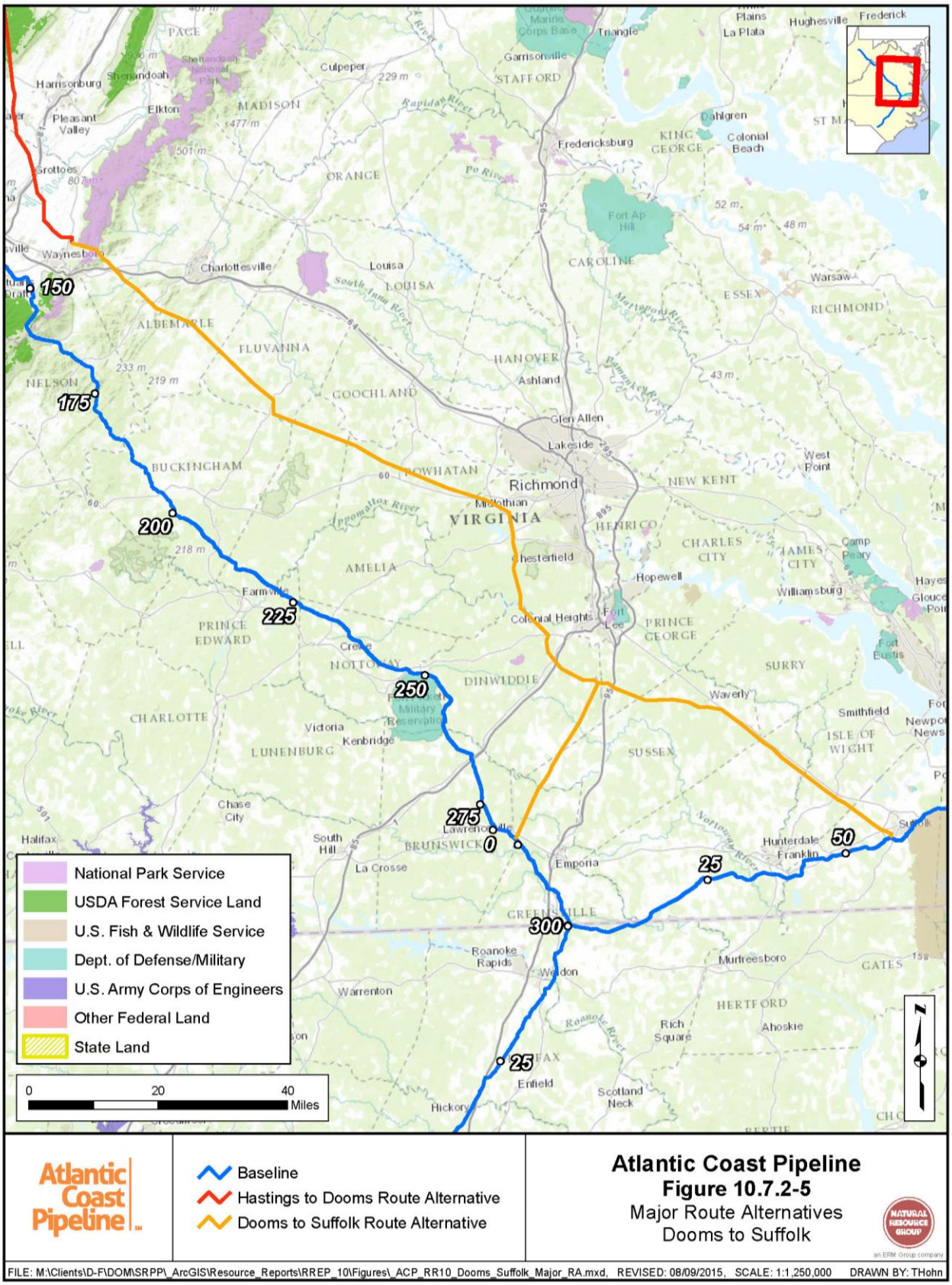
Dooms to Suffolk

The second segment of the conceptual route alternative, Dooms to Suffolk, would originate at the existing substation near Dooms in Augusta County, Virginia (see Figure 10.7.2-5). From this point, the conceptual route alternative would follow an existing DVP 500 kV electric transmission line for approximately 23 miles to the southeast across Augusta and Albemarle Counties, Virginia, crossing I-64 and passing west of Crozet and Charlottesville. The route would then follow an existing 115 kV electric transmission line (operator unknown) for approximately 20 miles to the south/southeast across Albemarle and Fluvanna Counties, Virginia to an existing power plant on the James River near New Canton.

Continuing from the power plant, the alternative route would follow an existing DVP 138 kV electric transmission line for about 40 miles to the southeast, crossing Cumberland, Powhatan, and Chesterfield Counties, Virginia. It would then follow a series of existing DVP electric transmission lines for approximately 54 miles to the south and east, crossing Chesterfield, Dinwiddie, Prince George, and Sussex Counties, Virginia, and passing west of the City of Richmond. The route would then follow a series of existing DVP electric transmission lines for about 33 miles to the southeast across Sussex and Isle of Wight Counties and the City of Suffolk, Virginia. It would terminate at approximate MP 58 of the AP-3 lateral west of the Great Dismal Swamp National Wildlife Refuge (GDS-NWR). In total, this route would measure about 170 miles in length.

The Dooms to Suffolk segment of the conceptual route alternative additionally would require a pipeline route to access the AP-4 and AP-5 delivery points for the ACP. Starting at a point north of Carlson, this route would follow a series of existing DVP electric transmission lines for approximately 27 miles to the southeast across Dinwiddie, Sussex, and Greensville Counties, Virginia. It would then follow a similar alignment as the ACP along the AP-1 mainline and AP-4 and AP-5 laterals for about 7 miles.

In total, the Dooms to Suffolk segment of the conceptual route alternative would measure about 204 miles in length. This is almost equivalent to the corresponding segment of the baseline, which includes about 151 miles along the AP-1 mainline (between MPs 149 and 300), 57 miles along the AP-3 lateral (between MPs 0 and 57), 0.6 mile along the AP-4 lateral (between MPs 0 and 0.3), and 1 mile along the AP-5 lateral (between MPs 0 and 1), for a total of 209.6 miles. Additionally, virtually the entire conceptual route alternative is adjacent to existing utilities compared to about 36 miles for the corresponding segment of the baseline. However, there are land use constraints along the Dooms to Suffolk segment of the conceptual route alternative which would increase the overall length of the route and decrease the amount of collocation.


National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
State Land
0
20
40
Miles
Baseline
Hastings to Dooms Route Alternative
Dooms to Suffolk Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-5
Major Route Alternatives
Dooms to Suffolk
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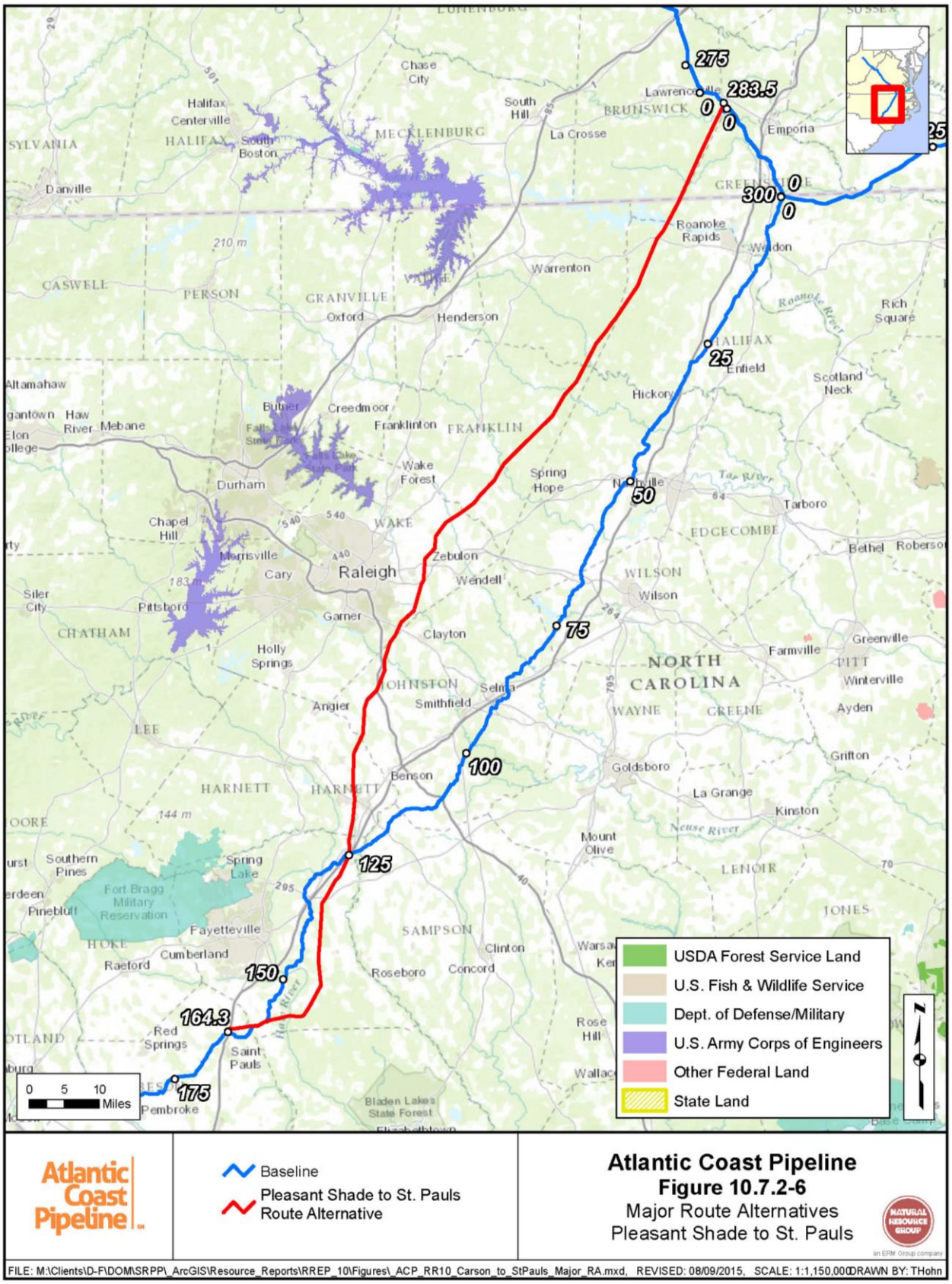
A greenfield route to the north to avoid the SNP and Appalachian Trail crossings would need to pass north of Front Royal, Virginia. An alternate route around Front Royal would likely originate along the Dooms to Suffolk segment of the conceptual route alternative near Mount Storm Lake; pass to the north of the GWNF in Frederick County; pass to the north of Front Royal in Warren County; and then head south across eastern Virginia to rejoin the Dooms to Suffolk segment in Chesterfield County. Assuming that this route would parallel existing electric transmission lines, it would measure at least 185 miles in length, which is about 20 miles longer than the corresponding segment of the conceptual route. This would add an additional 303 acres of construction right-of-way and 182 acres of permanent easement to the route.

In addition to the NPS lands, there are several places along the existing electric transmission lines where houses and other buildings have been built up to the existing rights-of-way. These include Yancey Mills in Albemarle County; Antioch in Fluvanna County; Hamilton in Cumberland County; Red Land and Holly Hills in Powhatan County; Midlothian in Chesterfield County; the area along the Appomattox River in Chesterfield and Dinwiddie Counties; Sutherland in Dinwiddie County; and the City of Suffolk. Greenfield route variations and adjustments in each of these places would be necessary to avoid developed lands. In particular, a major alternative route off the existing utility corridor would be required in Midlothian, which is a suburb on the outskirts of the City of Richmond. A new greenfield route alternative measuring at least 16 miles in length would be necessary to avoid the developments in and around Midlothian.

For all the reasons described above, the Dooms to Suffolk segment provides no environmental advantage over the Projects. Adjustments to the conceptual route would be necessary to avoid NPS lands in the SNP and along the Appalachian Trail as well as developed lands in several places along the route. Depending on the routes selected to avoid these areas, the increase in length relative to the baseline could be up to 45 miles, which would increase the environmental impact and cost of the Project. Therefore, the Dooms to Suffolk segment of the conceptual route alternative is not a viable or feasible alternative to the Projects.

Pleasant Shade to St. Pauls

The third section, Pleasant Shade to St. Pauls, would originate at approximate MP 284 of the AP-1 mainline route in Brunswick County, Virginia (see Figure 10.7.2-6). The route then would follow an existing DVP 500 kV electric transmission line for about 15 miles to the southwest across Brunswick County to the Commonwealth of Virginia/State of North Carolina line. It then would follow an existing Progress Energy Carolinas, LLC (PEC) 500 kV electric transmission line for about 60 miles to the southwest across Northampton, Halifax, Warren, Franklin, and Wake Counties, North Carolina. At a point near Knightdale, the alternative route would continue along the existing PEC 500 kV electric transmission line to the south-southwest for approximately 74 miles, crossing Wake, Johnston, Harnett, and Cumberland Counties, North Carolina, and passing east of the Cities of Raleigh and Fayetteville. The route would then head west along the existing PEC line for about 11 miles across Cumberland and Robeson Counties, North Carolina, to its terminus approximately at MP 164 of the AP-2 mainline.


275
283.5
0
0
0
300
0
25
25
50
75
100
125
150
164.3
175
Halifax
Centerville
HALIFAX
South Boston
Danville
Chase City
South Hill
MECKLENBURG
La Crosse
BRUNSWICK
Emporia
Roanoke Rapids
Weldon
Warrenton
CASWELL
PERSON
GRANVILLE
Oxford
Henderson
Roanoke River
Rich Square
Enfield
Scotland Neck
Hickory
Altamahaw
Haw River
Mebane
Butner
Creedmoor
Franklinton
FRANKLIN
Wake Forest
Spring Hope
Durham
Chapel Hill
WAKE
Tar River
Tarboro
EDGECOMBE
Bethel
Morrisville
Cary
Raleigh
Zebulon
Wendell
WILSON
Wilson
Siler City
Pittsboro
CHATHAM
Garner
Clayton
Holly Springs
Farmville
Greenville
PITT
Winterville
NORTH CAROLINA
JOHNSTON
Smithfield
Selma
Angier
WAYNE
GREENE
Ayden
LEE
Goldsboro
Grifton
Benson
HARNETT
La Grange
Kinston
Neuse River
Mount Olive
Southern Pines
Spring Lake
Fort Bragg Military Reservation
Pinebluff
LENOIR
JONES
Fayetteville
SAMPSON
HOKE
Cumberland
Raeford
Clinton
Roseboro
Concord
Red Springs
Saint Pauls
Rose Hill
Pembroke
Bladen Lakes State Forest
0 5 10 Miles
N
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
State Land
Atlantic Coast Pipeline
Baseline
Pleasant Shade to St. Pauls Route Alternative
Atlantic Coast Pipeline
Figure 10.7.2-6
Major Route Alternatives
Pleasant Shade to St. Pauls
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In total, the Pleasant Shade to St. Pauls segment of the conceptual route alternative would measure about 160 miles in length. However, additional laterals would need to be constructed to reach the same delivery points as the ACP in southeastern Virginia and North Carolina. The proposed AP-3 lateral would need to be extended about 15 miles to the west to reach the conceptual route alternative. Laterals also would be required to reach the Greensville M&R Station (about 1 mile), the Smithfield M&R Station (about 19 miles), and the Fayetteville M&R Station (about 3 miles). These additional laterals would increase the length of the conceptual route alternative by about 38 miles to 198 miles. In contrast, the corresponding segment of the baseline, i.e., from approximately MP 284 of the proposed AP-1 mainline to approximately MP 164 of the proposed AP-2 mainline, measures 179 miles in length. The increased length for the conceptual route alternative would result in an additional 164 acres of construction workspace and 109 acres of permanent easement for the ACP. [20]

Approximately 44 miles of the Pleasant Shade to St. Pauls segment crosses developed, residential areas in Franklin, Wake, and Johnston Counties on the outskirts of the City of Raleigh. Encroachment on the existing right-of-way would preclude construction of the pipeline adjacent to the existing electric transmission line in these areas. An alternative greenfield route to the east of these areas would be necessary to avoid the developed lands. The alternative route would measure 48 miles in length or more, increasing the length of the pipeline by at least 4 miles and adding an additional 53 acres of construction right-of-way and 24 acres of permanent easement. [21]

In a letter to Atlantic dated March 25, 2015, the U.S. Fish and Wildlife Service (FWS) commented that impacts on aquatic species could be minimized by reducing the number of stream crossings along the baseline route. The Pleasant Shade to St. Pauls segment of the conceptual route alternative would cross 12 more intermittent and 21 more perennial waterbodies than the baseline route, which could result in more impacts on aquatic species than the baseline. The conceptual route alternative would greatly increase the length, area of impact, and cost of the ACP. It additionally could result in greater impact on aquatic species than the baseline. Therefore, the Pleasant Shade to St. Pauls segment of the conceptual route alternative is not a viable or feasible alternative to the ACP.

10.7.3 Interstate and Federal Highways

Construction of pipelines within rights-of-way for Interstate and Federal highways (typically referred to as longitudinal utility installations) is subject to review by State/Commonwealth Departments of Transportation (DOT). According to the U.S. Department of Transportation's (USDOT) Federal Highway Administration, the use of Interstate highway rights-of-way to accommodate public utilities is permissible if the utility is in the public interest, the utility would not interfere with the safe and free flow of traffic, and the utility would not conflict with future expansions or uses of the highway. Federal Highway Administration regulations provide State/Commonwealth DOTs with broad authority to approve or deny

[20] These estimates are based on a 75-foot-wide construction right-of-way and a 50-foot-wide permanent easement for the AP-3 lateral and the other laterals which would be required for this alternative.

[21] These estimates are based on a 110-foot-wide construction right-of-way and a 50-foot-wide permanent easement, which would be required for the AP-2 mainline.

longitudinal installations of utilities in Interstate or Federal highway rights-of-ways and to assess fees for these installations (USDOT, 2014).

Large diameter pipelines typically cannot be sited within Interstate and Federal highway rights-of-way because they preclude or restrict future expansion of the highway rights-of-way. Similarly, large diameter pipelines cannot be sited adjacent to, but outside of, Interstate or Federal highway rights-of-way because they too can preclude future expansion of highways and often conflict with existing land uses along highways. Developments along highways, particularly at intersections, interchanges, bridges, and population centers, are significant constraints to routing a large diameter pipeline along an Interstate highway. Pipelines often need to be routed around these areas, which can increase the length, area of impact, and cost of the pipeline, and reduce or eliminate the benefits of collocation.

Topography along Interstate and Federal highways, particularly in areas with rugged terrain, can be another limiting factor. Interstate highways in mountainous areas are often built around and on the sides of mountains (i.e., in side slope terrain). As noted above, pipeline construction in rugged areas must typically cross ridges and hills perpendicular to the slope (i.e., along the natural fall of the slope). For this reason, construction adjacent to existing Interstate or highway in mountainous areas is not typically feasible. In these areas, a pipeline would need to be routed along an alternate parallel alignment to the highway, which would eliminate the benefit of collocation and could result in a larger area of impact for the pipeline. Even in areas where topography is favorable for collocation, pipeline construction along Interstate highways may be impractical due to cut and fill material along highway corridors and infrastructure development at intersections and bridges.

In the vicinity of the ACP, there are no Interstate highways, e.g., Interstate 79 (I-79), Interstate 64 (I-64), and Interstate 95 (I-95) that provide a reasonably direct path between the proposed receipt and delivery points in West Virginia and Virginia. [22] Consequently, and as discussed in more detail below, potential routes along an Interstate highway in West Virginia and Virginia would add substantially to the total length of the pipelines, which would increase the area of impact and cost of the ACP. In North Carolina, the I-95 corridor runs in the same general direction as the ACP, though it crosses various land use constraints, which preclude routing the pipeline in an adjacent corridor.

In addition to the Interstate highways, Atlantic identified and evaluated a conceptual alternative route along U.S. Highway 250, which follows a similar path as the proposed AP-1 mainline in portions of West Virginia and Virginia. As discussed below, a route adjacent to the highway would cross terrain unsuitable for a pipeline as well as various land use constraints, both of which preclude routing the pipeline adjacent to the highway.

10.7.3.1 Adjacent to Interstate 79 and Interstate 64

Interstate 79 (I-79) crosses the proposed AP-1 mainline route in Lewis County, West Virginia, near the town of Jane Lew. From this point, I-79 heads to the southwest and west, where it joins I-64 in Charleston, West Virginia. The highways then head southeast to the town

[22] In comments filed with the Commission, various individuals commented that the proposed ACP pipelines should be installed adjacent to interstate highways.

of Beckley, West Virginia. From this point, I-79 and I-64 split, with I-64 continuing to the east across the Appalachian Mountains to Lexington, Virginia, then northeast towards the City of Staunton, Virginia. The proposed AP-1 mainline route intersects I-64 at a point south of the City of Staunton in Augusta County, Virginia.

A conceptual route adjacent to the I-79 and I-64 corridors (see Figure 10.7.3-1) would measure approximately 260 miles in length, which is 127 miles longer than the corresponding segment of the proposed AP-1 mainline route. Construction along this route would result in an additional 1,924 acres of temporary construction impact and 1,155 acres of permanent pipeline easement. [23] This would significantly increase the area of impact and cost of the ACP.

Additionally, for much of the route, the pipeline could not be located immediately adjacent to the I-79 and I-64 corridors due to difficult, mountainous terrain, which would require alternate greenfield routing along parallel ridgelines, and to land use constraints along the highways. The latter include the Cities of Charleston and Beckley, West Virginia, and a 16-mile-long segment of I-64 adjacent to the Kanawha River between Charleston and Cabin Creek, which is highly developed. Bypassing these and other developed areas along the highways would require alternative greenfield routes. This would increase the length, area of impact, and cost of the conceptual alternative route, and forgo the benefits of collocation.

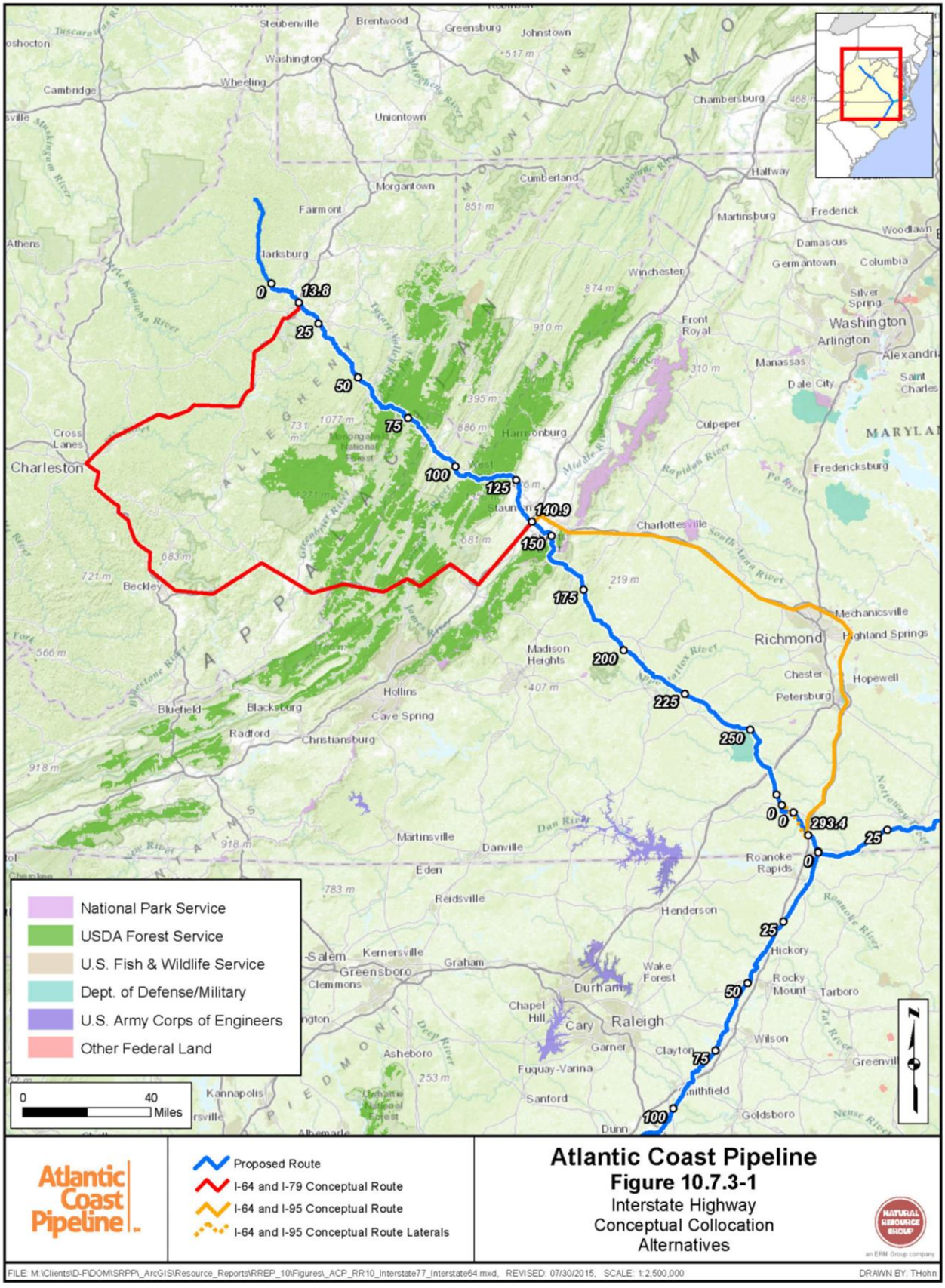
For all the reasons described above, the I-79 and I-64 corridors are not viable or feasible alternatives to the proposed AP-1 mainline.

10.7.3.2 U.S. Highway 250

Atlantic identified and assessed a conceptual alternative route adjacent to U.S. Highway 250 in response to comments received from the Federal Energy Regulatory Commission (FERC). Starting at approximately MP 57, the conceptual route follows the U.S. Highway 250 corridor from near Huttonsville, West Virginia, to the southeast for approximately 80 miles, crossing Randolph and Pocahontas Counties, West Virginia, and Highland and Augusta Counties, Virginia. It reconnects with the proposed AP-1 mainline route near MP 129 in Augusta County, Virginia (see Figure 10.7.3-2).

The conceptual route alternative adjacent to U.S. Highway 250 would measure approximately 80 miles in length, which is approximately 8 miles longer than the corresponding segment of the AP-1 mainline. Although the highway and pipeline route are oriented in the same general direction, it would not be feasible to construct a large diameter pipeline adjacent to the highway due to the steep, mountainous terrain in this area. The highway uses switchback turns to follow contours and cross side-slope topography. Pipeline construction typically crosses mountains perpendicular to the slope to provide a level work surface for construction and minimize the potential for post-construction slope failures. In most places along the highway, the pipeline would need to be routed up and over ridgelines on an alignment which parallels, but is not adjacent, to U.S. Highway 250. The resulting alignment would be similar to the currently proposed route for the AP-1 mainline.

[23] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.


National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
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40
Miles
Proposed Route
I-64 and I-79 Conceptual Route
I-64 and I-95 Conceptual Route
I-64 and I-95 Conceptual Route Laterals
Atlantic Coast Pipeline
Figure 10.7.3-1
Interstate Highway
Conceptual Collocation
Alternatives
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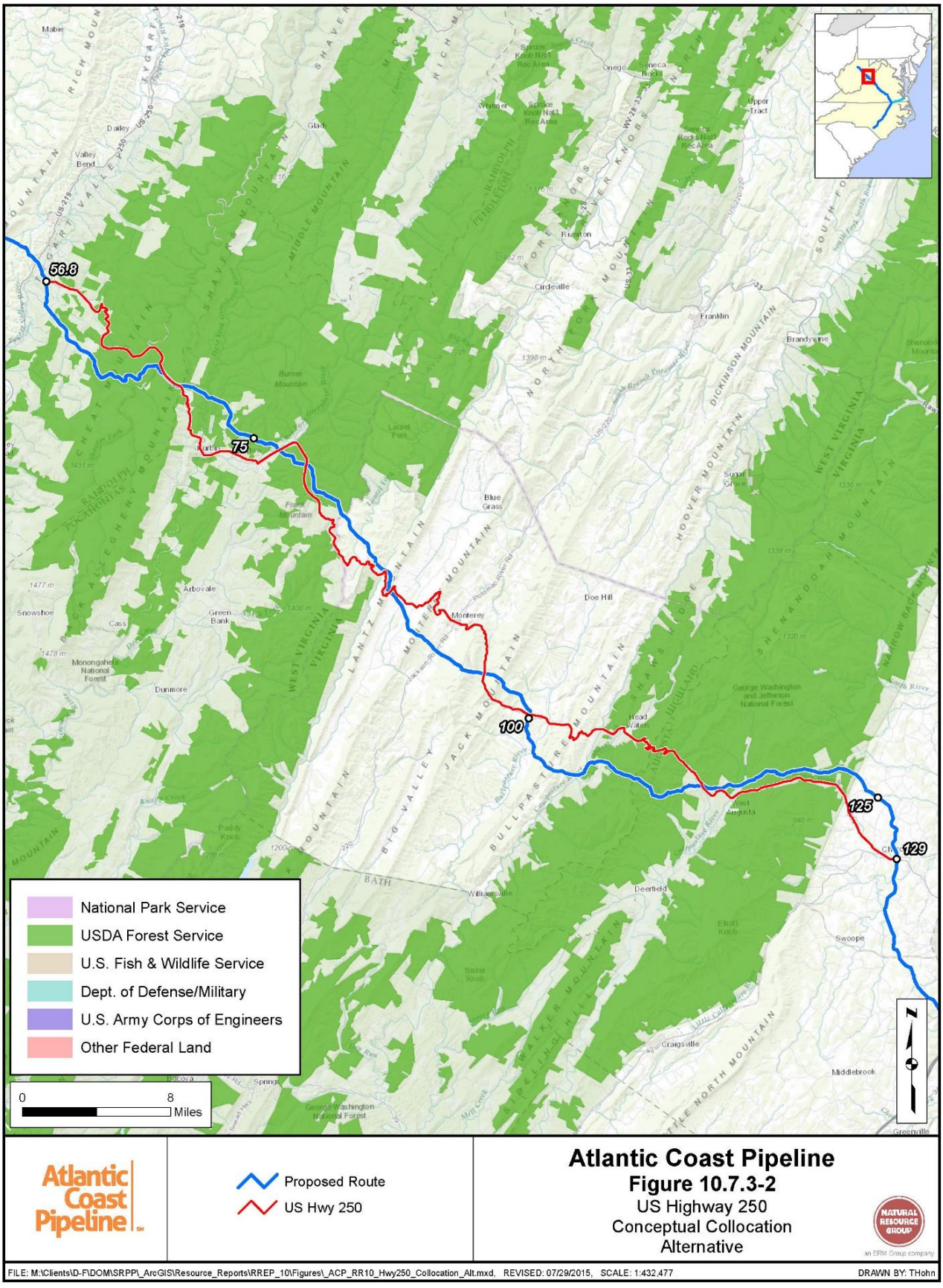
56.8
75
100
125
129
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0
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Miles
Proposed Route
US Hwy 250
Atlantic Coast Pipeline
Figure 10.7.3-2
US Highway 250
Conceptual Collocation
Alternative
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In addition to terrain constraints, much of the corridor along U.S. Highway 250 is lined with residential or small commercial developments. Although no major urban areas are crossed by this section of the highway, the corridor does cross developed areas near Huttonsville, Durbin, and Bartow, West Virginia, and Monterey, McDowell, Head Waters, West Augusta, Lone Fountain, and Churchville, Virginia. Due to limited lands suitable for pipeline construction near these areas, the proposed pipeline would need to be routed up and over ridgelines on an alignment which parallels, but is not adjacent, to U.S. Highway 250. The resulting alignment would be similar to the currently proposed route for the AP-1 mainline.

Another issue with a route adjacent to U.S. Highway 250 is that long stretches of the corridor would be immediately adjacent to waterbodies. The highway crosses several valleys and parallels, is adjacent to, or is near waterbodies in these areas, including Riffle Creek, Red Run, Shavers Fork, Blister Run, East Fork and West Fork of Greenbrier River, and Little River in West Virginia; and Crab Run, Derrick Hollow, Ramseys Draft, Calfpasture River, and Jennings Branch in Virginia. In many areas, there is insufficient space between the highway and waterbody to construct a large diameter pipeline. Moreover, pipelines are not typically constructed parallel and adjacent to waterbodies (as opposed to crossing waterbodies) due to the increased potential for impacts in the waterbodies due to sediment from construction and restoration activities.

10.7.3.3 Interstate 64, Interstate 295, and Interstate 95

Atlantic reviewed a conceptual alternative route in Virginia along the I-64, Interstate 295 (I-295), and I-95 corridors. Starting approximately at MP 141 of the AP-1 mainline, the conceptual alternative route would follow I-64 southeast to Richmond; then follow I-295 to the north and east of Richmond; then follow I-95 south to Greensville County, Virginia. It would reconnect with the proposed AP-1 mainline route near MP 293 in Greensville County, Virginia (see Figure 10.7.3-1).

The conceptual alternative route adjacent to the I-64, I-295, and I-95 corridors would measure approximately 185 miles in length, which is 33 miles longer than the corresponding segment of the AP-1 mainline route. In addition, a new pipeline lateral would be required to access the receipt/delivery point in Brunswick County (i.e., the Brunswick M&R Station). The lateral to Brunswick County would measure approximately 11 miles in length. In total, approximately 46 miles of additional pipeline would need to be constructed for the conceptual alternative route relative to the ACP as proposed. The increased length would result in an additional 600 acres of temporary construction right-of-way and an additional 367 acres of permanent easement, which would significantly increase the area of impact and cost of the ACP.[24]

Additionally, alternative greenfield routes in many areas would be necessary to avoid mountainous terrain, particularly where I-64 crosses the Blue Ridge Mountains, as well as

[24] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline and a 75-foot-wide construction right-of-way and 50-foot-wide permanent easement for the new lateral to the delivery point in Brunswick County, Virginia. The conceptual AP-1 mainline adjacent to I-64 and I-95 would result in an additional 500 acres of construction right-of-way and 300 acres of permanent easement. The conceptual route for the new lateral would result in an additional 100 acres of construction right-of-way and 67 acres of permanent easement.

developed and urban lands along the highways in and around the Cities of Staunton, Waynesboro, Charlottesville, Richmond, and Petersburg, Virginia. In particular, a major route alternative would be necessary to avoid highly developed areas which encroach on I-295 and I-95 around Richmond and Petersburg. The greenfield route alternatives would increase the length of the pipeline, the area of impact, and the cost of the ACP even further.

For all the reasons described above, the I-64, I-295, and I-95 corridors are not viable or feasible alternatives to the proposed AP-1 mainline.

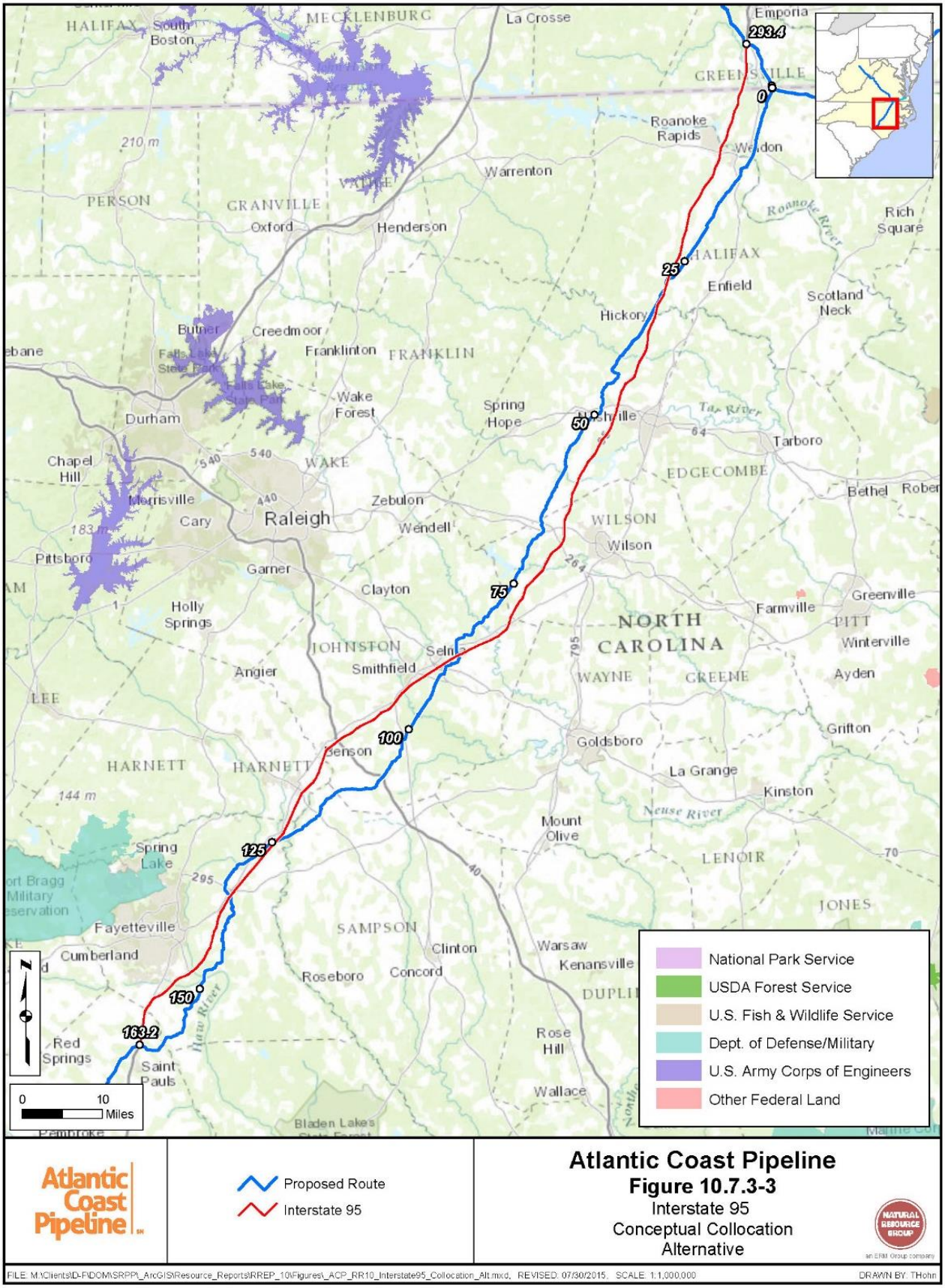
10.7.3.4 Interstate 95

Atlantic reviewed a conceptual route alternative in southern Virginia and North Carolina along the I-95 corridor, which follows a similar path as the proposed ACP. Starting approximately at MP 293 of the AP-1 mainline route in Greensville County, Virginia, the conceptual alternative would route follow the I-95 corridor to the southwest for approximately 153 miles to a point where it connects with the AP-2 mainline route approximately at MP 164.0 (see Figure 10.7.3-3). The conceptual route adjacent to the highway would measure 153 miles long, while the corresponding segment of the AP-1 and AP-2 mainline routes is about 171 miles long. The alternative route additionally would require increasing the length of the AP-3 lateral by approximately 4 miles to connect with the AP-1 and AP-2 mainlines.

The alternative route adjacent to I-95 would be 13.5 miles shorter than the corresponding segments of proposed ACP routes and would increase collocation with an existing linear corridor facility. However, the route would be infeasible in most locations along the highway, which is a developed corridor. I-95 passes developed areas in or near Roanoke Rapids, Rocky Mount, Wilson, Selma, Smithfield, Benson, Dunn, and Fayetteville, North Carolina. Substantial segments of greenfield corridor would be necessary to avoid these developed areas, which would increase the length of the pipeline by dozens of miles and reduce or eliminate the benefits of collocation (such as reduced forest fragmentation).

In addition to the developed areas, the I-95 corridor in North Carolina has numerous interchanges and entry/exit ramps, many of which are surrounded by existing developments, such as filling stations, restaurants, and industrial or commercial facilities. The ACP would be required to avoid the developed areas at the interchanges, which would increase the length of the pipeline and reduce or eliminate the benefits of collocation in these areas. With approximately 50 interchanges along the I-95 corridor between the North Carolina/Virginia border and the end of the conceptual alternative route, avoidance of developed areas at the interchanges would likely add a minimum of about 15 miles of new pipeline to the route. Moreover, the route adjacent to I-95 would conflict with future highway expansion and future development along the highway corridor.

For all the reasons described above, a conceptual alternative route adjacent to I-95 is not a viable or feasible alternative to the proposed ACP.


HALIFAX
South Boston
MECKLENBURG
La Crosse
Emporia
293.4
0
GREENSVILLE
Roanoke Rapids
Weldon
210 m
Warrenton
VANCE
PERSON
GRANVILLE
Oxford
Henderson
Roanoke River
Rich Square
25
HALIFAX
Enfield
Scotland Neck
Hickory
Butner
Creedmoor
Franklinton
FRANKLIN
Falls Lake State Park
Wake Forest
Spring Hope
50
Tar River
64
Tarboro
Durham
Chapel Hill
540
WAKE
EDGECOMBE
Bethel
Merrisville
Cary
Raleigh
Zebulon
Wendell
WILSON
Wilson
183 m
Pittsboro
Garner
264
75
Clayton
Holly Springs
Farmville
Greenville
PITT
NORTH CAROLINA
Winterville
JOHNSTON
Selma
Smithfield
795
Angier
WAYNE
GREENE
Ayden
LEE
Grifton
100
Goldsboro
Benson
HARNETT
La Grange
Kinston
144 m
Neuse River
Mount Olive
Spring Lake
125
LENOIR
70
295
40
JONES
Fayetteville
SAMPSON
Cumberland
Clinton
Warsaw
Kenansville
Roseboro
Concord
DUPLIN
150
Rose Hill
163.2
Red Springs
Saint Pauls
Wallace
0
10
Miles
Bladen Lakes
National Park Service
USDA Forest Service
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
Atlantic Coast Pipeline
Proposed Route
Interstate 95
Atlantic Coast Pipeline
Figure 10.7.3-3
Interstate 95
Conceptual Collocation
Alternative
NATURAL RESOURCE GROUP
an ERM Group company
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10.7.4 Routes that Avoid Lands Administered by the U.S. Forest Service

In scoping comments submitted to the FERC on April 27, 2015, the USFS requested an analysis of potential route alternatives that would avoid crossings of USFS lands, and if possible, utilize existing linear corridor facilities to the extent practicable. Direct routes for the AP-1 mainline between the proposed receipt point in Harrison County, West Virginia and the proposed delivery points in Buckingham, Brunswick, and Greensville Counties, and the City of Chesapeake, Virginia, require crossings of Federal lands within the MNF, GWNF, and/or JNF given the trajectory of the ACP relative to the configuration and extent of USFS landholdings in West Virginia and Virginia. Federal lands in the MNF, GWNF, and JNF collectively extend northeast to southwest from points in Frederick County, Virginia, and Hampshire County, West Virginia, to points along the Virginia/Tennessee border in Washington County, Virginia. These landholdings, together with SNP and the Blue Ridge Parkway (administered by the NPS) and Canaan Valley National Wildlife Refuge (administered by the FWS) form near contiguous stretches of Federal lands along the Virginia and West Virginia borders.

To address the request from the USFS, Atlantic and DTI identified two conceptual alternative routes, the Northern USFS Alternative Route and Southern USFS Alternative Route, which avoid Federal lands in the MNF, GWNF, and JNF as well as lands administered by the NPS and the FWS. The Northern USFS Alternative Route passes east of the northernmost extent of Federal lands in the MNF and GWNF. The Southern USFS Alternative Route crosses a narrow gap in Federal lands in the JNF near Narrows in Giles County, Virginia.

Atlantic and DTI identified two additional localized route alternatives that avoid USFS-administered lands, with the exception of a small section of National Forest land where the routes cross the Appalachian National Scenic Trail (Appalachian Trail) south of Wintergreen in Augusta County, Virginia. These two more-local route alternatives, which were identified in an effort to reduce the length of the Northern and Southern USFS Alternative Routes, pass around smaller, isolated segments of USFS-administered lands as opposed to going completely around the National Forests.

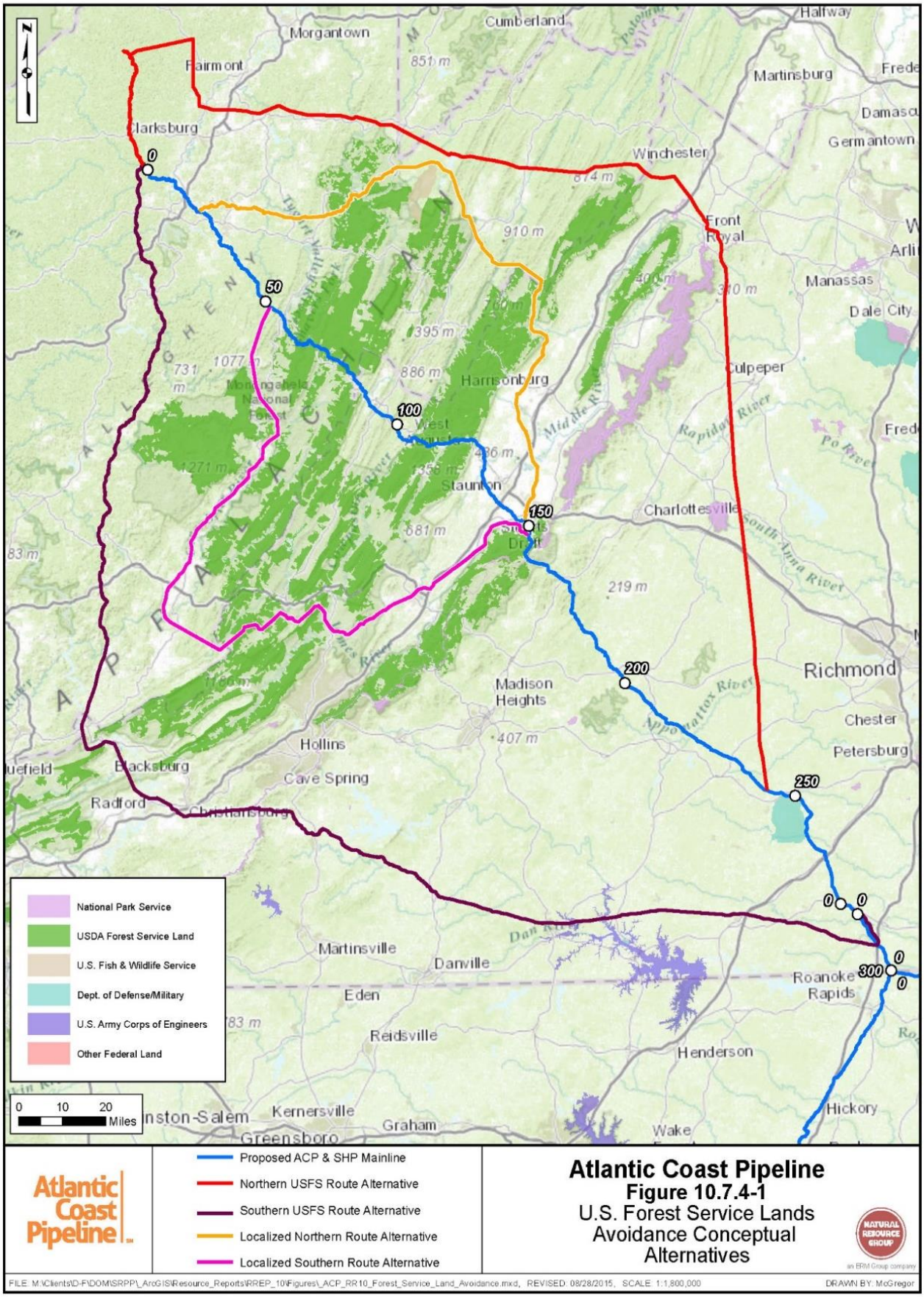
These two conceptual and two localized route alternatives are depicted on Figure 10.7.4-1 and discussed in the subsections below. A comparison of the length of the proposed route and the four route alternative routes is provided in Table 10.7.4-1.

TABLE 10.7.4-1

U.S. Forest Service Lands Avoidance
Approximate Route Lengths for the Atlantic Coast Pipeline and Supply Header Project [a]

Route Alternative	Proposed Route Length (miles) [b]	Alternative Route Length (miles) [b]	Difference in Length (miles) [c]	Difference in Land Disturbance (acres) [d]
Northern USFS Alternative Route	275	321	46	697
Southern USFS Alternative Route	292	367	75	1,136
Localized USFS Northern Route	123.7	170	46.3	530
Localized USFS Southern Route	92.6	195.8	103.2	1,349

[a] The length of the alternatives routes is based on desktop measurements. The routes would likely be longer if field checked for routing and constructability.
[b] This is the length of the proposed route relative to the corresponding segment of the alternative route.
[c] This is the difference in length between the proposed route and the corresponding segment of the alternative route.
[d] Assuming a 125-foot-wide construction right-of-way, this is the difference in land disturbed by construction between the proposed route and the corresponding segment of the alternative route.


Morgantown
Fairmont
Clarksburg
Cumberland
Martinsburg
Winchester
Front Royal
Manassas
Dale City
Culpeper
Harrisonburg
Staunton
Charlottesville
Richmond
Madison Heights
Chester
Petersburg
Hollins
Cave Spring
Blacksburg
Radford
Christiansburg
Martinsville
Danville
Eden
Reidsville
Roanoke Rapids
Henderson
Hickory
Kernersville
Graham
Greensboro
Wake
0
50
100
150
200
250
300
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 20 Miles
Proposed ACP & SHP Mainline
Northern USFS Route Alternative
Southern USFS Route Alternative
Localized Northern Route Alternative
Localized Southern Route Alternative
Atlantic Coast Pipeline
Figure 10.7.4-1
U.S. Forest Service Lands
Avoidance Conceptual
Alternatives
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10.7.4.1 Routing Constraints within the National Forest Study Area

Several significant routing constraints must be overcome when identifying useable routes to avoid USFS lands in this large a geographic area. These include:

- Federal land ownership and control, including areas with special designations;
- mountainous terrain and limitations associated with available workspace, steep slopes, and side-slopes during construction; and
- required receipt and delivery points on the ACP system.

These constraints are described below.

Federal Land Ownership and Control

In addition to the MNF, GWNF, and JNF, there are a number of other Federal lands in the vicinity of the ACP, including SNP, the Blue Ridge Parkway, and segments of the Appalachian Trail (administered by the NPS) and the Canaan Valley National Wildlife Refuge (administered by the FWS). [25] The NPS, which can consider and issue a right-of-way grant for a natural gas pipeline to cross the Blue Ridge Parkway, does not have comparable administrative authority to consider and issue a right-of-way grant for a natural gas pipeline to cross other lands managed by the NPS, such as SNP or the Appalachian Trail on lands owned by the NPS. The USFS and FWS both have administrative authority to consider and issue right-of-way grants for natural gas pipelines to cross USFS or FWS lands, respectively.

The National Park System was first created by the Executive Branch, but subsequently was expanded by multiple acts of the U.S. Congress and actions by the President. The NPS is charged with preserving lands of unparalleled natural, historic, and recreational values for the enjoyment of future generations. These lands of great natural beauty and storied history are protected by the NPS, leaving them unimpaired for future generations.

The SNP and NPS-owned segments of the Appalachian Trail Corridor extend without break for approximately 81 miles to the north of the proposed ACP centerline where it crosses the Blue Ridge Mountains. These NPS lands cause all potential alternative routes north of the proposed route to extend at least 81 miles to the north around the northern end of the SNP. Such a route would substantially increase the length, footprint, and associated impact of the ACP, as described in more detail below.

[25] The USFS and FWS have general statutory authority to grant rights-of-way for natural gas pipelines over the lands that they administer; the NPS does not. As a consequence, absent park-specific authority (such as that found in the statute establishing the Blue Ridge Parkway), NPS cannot grant a right-of-way for a natural gas pipeline without an act of Congress.

The USFS has the administrative authority to allow for natural gas pipelines to cross National Forest lands in locations that do not conflict with the management objectives of the area. As described in its mission statement, the USFS was established "to sustain the health, diversity, and productivity of the nation's forests to meet the needs of present and future generations." The USFS carries out this purpose by ensuring that National Forests provide for multiple uses and sustainable yields that maximize long-term benefits in an environmentally sound manner.

The mission of the FWS is to "to conserve, protect, and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people." The FWS has the administrative authority to allow for a natural gas pipeline to cross a National Wildlife Refuge provided that the pipeline is found to be a compatible and appropriate use given the management objectives specific to the refuge.

Within the Federal lands in the Project region, there are a number of areas with special management designations, such as roadless areas, Wilderness Areas, potential wilderness areas, remote backcountry areas, and scenic areas. When combined with limitations associated with steep terrain (see below), these areas effectively block the potential for an alternate pipeline route for a total distance of about 178 miles, essentially a majority of the Virginia and West Virginia section of the Appalachian Mountains. The only exception to this is a relatively narrow corridor leading to a 1.3-mile section of USFS lands adjacent to the Blue Ridge Parkway in Augusta County, Virginia. This section of USFS land contains a portion of the Appalachian Trail where it is currently proposed to be crossed by the AP-1 mainline. This is the only potential location in the Project region where the Appalachian Trail is not on NPS-administered lands and where it would be accessible without crossing other Federal lands with special management designations. Because of this, ACP route alternatives that traverse the 178-mile-long section of the Appalachian Mountains must cross this area.

Construction Limitations Associated with Mountainous Terrain

The mountainous terrain in the vicinity of the proposed pipeline route causes siting and construction-related challenges that limit the identification and possible use of alternative routes. The need to avoid side-slope construction areas is one of the constraints associated with this terrain. Because of the multitude of ridgelines covering the area, a larger percentage of pipeline routes have to be located on the perpendicular fall of the slope (i.e., straight up or down the slope), which often means limiting route locations to fall lines that include ridgelines to avoid side-slope construction. Pipeline construction requires the contractor to utilize a flat working surface across the right-of-way to provide a safe working area for operating equipment and maneuvering heavy pipe joints (40-foot sections of 42-inch-diameter, 5/8-inch thick, steel pipe). In order to provide a flat, safe working surface on side-slope areas, cut-and-fill excavation, and grading would be required.

Within a side-slope area, cut-and-fill operations to create a flat area require the excavation and movement of large volumes of soil, which requires a construction right-of-way footprint upwards of 200 to 300 feet wide. After installation of the pipeline, the cut-and-fill area must be restored to preconstruction conditions and stabilized through soil packing, seeding, and other site-specific soil stabilization measures, as necessary. Because side-slope construction requires wider rights-of-way, the construction footprint is larger, and more tree clearing, soil stabilization, and restoration is required, all of which increase environmental impact and soil stabilization risk. While following ridgelines allows the construction right-of-way to follow the fall line of the slope and avoid cut-and-fill excavations, the ridgelines sometimes can be narrow which also limits the amount of space available for construction, especially if another right-of-way is already located on the ridgeline. This limits available routing opportunities and often prevents collocation with other utilities in the area.

Excessively steep terrain is another construction-related limiting factor in the identification of potential alternative routes to avoid USFS lands (for example, see the discussion in Section 10.8.1.2 regarding the MNF 5 route alternative). Slope greater than 35 percent requires construction equipment, pipe joints, and other materials to be winched upslope along the construction right-of-way to gain access to the area and to complete construction. Winching equipment is placed on a graded and flat winch-site located on the crest of the ridge top. Without existing roadways on the ridge top, access to these areas generally has to be constructed on the ridge top, further increasing the construction footprint and area affected by construction. Steep slope construction is avoided where possible, which further limits routing opportunities. Like side-slope areas, steep slopes exceeding 35 percent were determined to be routing constraints and were avoided where possible during the identification of potential routing opportunities to avoid USFS lands.

Required Receipt/Delivery Locations

As discussed above in Section 10.2, the ACP (including the locations of receipt and delivery points) was designed based on customer requirements and an assessment of flow dynamics relative to receipts and deliveries of natural gas into and out of the system. Atlantic is required to utilize the receipt and delivery locations as specified in precedent agreements with its customers because only those locations will meet the purpose and need of the Project (see Table 1.2-1 in Resource Report 1). One of the specific receipt/delivery points that ACP is required to utilize is the proposed interconnect with Transco in Buckingham County, Virginia. The Northern and Southern USFS Route Alternatives would not be able to interconnect with Transco at the proposed Buckingham Interconnect as specified in the precedent agreements (without the addition of a longer reroute or a new lateral), and would therefore not meet the customer requirements under ACP's obligation.

10.7.4.2 Conceptual Routes that Avoid Crossings of U.S. Forest Service Lands

Northern USFS Alternative Route

The Northern USFS Alternative Route is a modified version of the Hastings to Dooms conceptual route discussed in Section 10.7.2.2. The first segment of this conceptual route

alternative would originate at DTI's existing Mockingbird Hill Compressor Station (i.e., approximately at MP 33.6 of the proposed TL-635 loop) near Hastings in Wetzel County, West Virginia (see Figure 10.7.2-3). Even though the alternative route would originate at this point, approximately 33 miles of new pipeline loop would still be required for the SHP because of receipt obligations south of the Mockingbird Hill Compressor Station. Rather than 30-inch diameter pipe, which is proposed for the TL-635 loop, the new pipeline would consist of about 17 miles of 24-inch diameter pipeline and 16 miles of 20-inch diameter pipeline. For these reasons, the Hastings to Dooms segment includes the proposed TL-635 loop as a component of the conceptual route alternative.

Starting at the northern end of the SHP, the Northern USFS Alternative Route initially follows the same alignment as Hastings to Dooms east across northern West Virginia for about 93 miles. Collocating with power line corridors in this section of West Virginia would require the crossing of about 90 miles of steep side-slope that the existing power lines have spanned. Building a pipeline along this route is infeasible due to the amount of exposed workspace needed to create a useable and safe construction surface, as well as the corresponding amount of disrupted soils to be replaced, stabilized, and contoured to pre-existing slope conditions. This amount of excessive clearing and soil disturbance along the existing right-of-way would not only increase the amount of environmental impact due to increased tree clearing and soil movement, but would also substantially increase the risk of slope failure in these side slope locations.

At a point near Mount Storm Lake in Grant County, West Virginia, the route would turn due east and follow an existing MPC electric transmission line for about 53 miles to the east to Frederick County, Virginia, and for 18 miles to the south into Warren County, Virginia, just past a crossing of the Shenandoah River. These segments pass north of USFS lands in the MNF and GWNF as well as NPS lands in SNP. The route would then continue south along a greenfield corridor for 123 miles, terminating along the proposed AP-1 mainline in Nottoway County, Virginia. Like the Hastings to Dooms segment, construction of the proposed SHP would still be required for the Northern USFS Alternative Route to access the same supply areas as the Projects.

As discussed above, the design of the Projects was based on customer requirements and precedent agreements which specify the locations of receipt and delivery points on the ACP. The locations of these points were designed to enhance transportation capabilities on the ACP based on a combination of flow dynamics relative to receipts and deliveries of natural gas into and out of the system. One of the specific receipt/delivery locations identified in its precedent agreements that ACP is required to utilize is the proposed interconnect with Transco in Buckingham County. In particular, three customers (Duke Energy Progress, Inc., Duke Energy Carolinas, LLC, and Piedmont Natural Gas Co., Inc.) identified the existing Transco system as a primary delivery point and a primary receipt point with an interconnection in Buckingham County, Virginia. The Northern USFS Route Alternative would not be able to interconnect with Transco at the required site and would not meet the customer requirements under ACP's obligation. See Section 10.7.1.2 for a more detailed discussion of Atlantic's geographic requirements for connections with the Transco pipeline system.

The Northern USFS Alternative Route would require construction of 288 miles of 42-inch-diameter pipeline compared to 242 miles for the corresponding section of the AP-1 mainline as proposed, adding an additional 46 miles of pipeline route. From a mileage standpoint, this would increase the area of environmental impact for the ACP by adding approximately 697 acres of temporary construction right-of-way and 418 acres of new permanent easement. [26] Additionally, as discussed for the Hastings to Dooms segment in Section 10.7.2.2, there are a number of constructability issues such as restricted room for construction, particularly on narrow ridgelines, and the need for side-slope construction due to terrain. These constructability issues are created by attempting to collocate the route with existing utilities or with avoidance of competing constraints, such as residential areas, sensitive habitats, or protected land uses. Routing the alternative to cross more suitable terrain along this general corridor would require leaving the transmission line right-of-way to utilize constructible terrain and would result in at least 145 miles of greenfield rather than collocated corridor, resulting in a longer overall pipeline route and greater environmental impact.

In addition to the constraints and impacts discussed above, the added length of pipeline over the proposed route across these specific route locations would require an additional 13,220 hp of compression. Adding this compression would require that an additional compressor station be built between the proposed Compressor Station 1 (Lewis County, West Virginia) and Compressor Station 2 (Buckingham County, Virginia). The additional air emissions that would be associated with this additional station are provided in Table 10.7.4-2.

TABLE 10.7.4-2

Estimated Air Emissions Associated with an Additional Compressor Station (13,220 horsepower) for the Atlantic Coast Pipeline

		Criteria Pollutants (tons per year)						
Combustion Sources	ID	NO_X	CO	VOC	SO_2	PM_f/ PM_{10f}/ $PM_{2.5f}$	PM_c	CO_2e
Solar Mars 90 Turbine	CT-01	10.5	18.1	1.83	1.80	3.06	7.57	66,265
Caterpillar G3516C emergency generator	EG-01	0.116	0.451	0.123	0.0004	0.0279	0.007	129
Boiler	WH-01	2.30	3.86	0.253	0.028	0.087	0.262	5,546
Fugitive Leaks – Blowdowns	FUG-01	-	-	7.06	-	-	-	6,028
Fugitive Leaks – Piping	FUG-02	-	-	13.4	-	-	-	11,428
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	1.76E-05	-	-	-	-
Total		**12.9**	**22.4**	**23.0**	**1.82**	**3.18**	**7.84**	**89,396**

* Boiler, Emergency Generator, and Tanks assumed the same as ACP Compressor Station1; fugitive leaks emissions estimated at 1/2 the level of ACP Compressor Station 1.

Notes: NO_X = nitrous oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; VOC = volatile organic compounds; PM_f = fine particulate matter; PM_C = course particulate matter; ; CO_2e =carbon dioxide equivalents

[26] These estimates are based on a 125-foot-wide construction right-of-way and a 75-foot-wide permanent easement for the 42-inch-diameter pipeline segments and do not include additional workspace requirements that would be associated with side-slope construction.

While cost is not the sole factor considered in the evaluation of the feasibility of alternatives considered for the Project, this factor must be considered. The additional cost associated with the increased length of the pipeline is estimated to be approximately $423 million (not including increased construction costs associated with extensive side-slope construction and restoration), and the estimated cost of the additional compression facilities is estimated at $66 million. The total increase in cost to the Project would be approximately $490 million.

For all these reasons, as well as the reasons listed for the Hastings to Dooms alternative described in Section 10.7.2.2 above, the Northern USFS Alternative Route is not a viable or feasible alternative to the proposed AP-1 mainline.

Southern USFS Alternative Route

The Southern USFS Alternative Route is a modified version of the MVP Option 1 conceptual route discussed in Section 10.7.1.2. Starting at the proposed receipt point in Harrison County, West Virginia, the route would follow a similar alignment as the MVP Option 1 for approximately 125 miles to the south. After crossing the Greenbrier River into Summers County, West Virginia, the route would head south, away from the MVP route, along a greenfield corridor for about 26 miles to a point near Narrows in Giles County, Virginia. The route would then continue east along a greenfield corridor for about 47 miles, passing around and between Federal lands in the JNF in the vicinity of Bluff City and Pearisburg, Virginia. This segment of the route would cross developed lands in the vicinity of Christiansburg and would require four separate crossings of the New River. In Pulaski County, Virginia, the route would follow the same alignment as MVP Option 1 for approximately 65 miles to the southeast, then an existing Transco pipeline for about 103 miles to the east, terminating along the proposed AP-1 mainline route in Greensville County, Virginia, near the City of Emporia.

As discussed above, one of the specific receipt/delivery locations identified in its precedent agreements that Atlantic is required to utilize is the proposed interconnect with Transco in Buckingham County, Virginia. The Southern USFS Route Alternative would not be able to interconnect with Transco at the required site and would not meet the customer requirements under ACP's obligation.

Because it would be similar to MVP Option 1, the Southern USFS Alternative Route has the same limitations as the MVP Option 1 route relative to the ACP as proposed. This alternate route would increase the length of the ACP by approximately 75 miles and would increase the area of environmental impact for the ACP by adding 1,136 acres of temporary construction right-of-way and 682 acres of permanent easement. [27] Hydraulic studies also confirmed that the additional 75 miles of pipeline, crossing this terrain, would require an additional 13,200 hp at a new compressor station located somewhere between proposed Compressor Stations 1 and 2. The additional air emissions that would be associated with this additional station are provided in Table 10.7.4-2.

[27] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.

The additional cost of the new compressor station would be approximately $66 million. Together with the additional cost relative to the increased length of pipeline, estimated to be $690 million, the total added Project cost would be approximately $756 million.

Another issue with the Southern USFS Alternative is that the difficult terrain along much of the route in West Virginia would not allow for the construction of two pipelines in a common corridor, nor would the size of the pipeline allow for the total delivery volume of the ACP and MVP to be transported in a single pipeline without the addition of 11 new greenfield compressor stations between Compressor Stations 1 and 2 (see the description of the single pipeline option in Section 10.7.1.2). As discussed above, much of the MVP Option 1 route in West Virginia follows ridgelines with narrow crests and steep side-slopes where there is insufficient space for two adjacent pipelines. To address this, in many areas, the proposed MVP pipeline and AP-1 mainline would need to be routed in separate corridors, which would eliminate the benefits of collocation, such as reduced forest fragmentation.

If following the MVP was feasible, it would avoid crossing most USFS lands. However, for all the reasons discussed above, as well as the reasons listed for the MVP Option 1 alternative described in Section 10.7.1.2, construction of the Southern USFS Route Alternative is not viable or feasible,

10.7.4.3 Localized Routes that Reduce Crossings of U.S. Forest Service Lands

While the USFS specifically requested an analysis of alternatives that completely avoid USFS lands, Atlantic also identified and assessed existing pipeline and electric transmission line corridors that occur near the National Forests that, if feasible, could reduce the crossing of USFS lands (see Sections 10.7.1 and 10.7.2). These localized corridors are in addition to those utilized by the Northern and Southern USFS Alternative Routes. To more fully assess these potential routing opportunities, and to optimize the initial USFS avoidance review described above, Atlantic identified two additional localized route alternatives that attempt to minimize USFS-administered lands instead of completely avoiding them. A description of these two route alternatives is presented below.

Localized Northern USFS Alternative Route

To avoid most USFS lands by going to the north of ACP's currently proposed route, a localized or Northern Route Alternative was identified that would originate near MP 19.6 of the AP-1 mainline in Lewis County, West Virginia. This route alternative would proceed due east for about 36 miles through Lewis, Upshur, Barbour, and Randolph Counties, before turning northeast for about 20 miles through Tucker County, West Virginia, while weaving between USFS lands. It would then continue east around the north end of the Canaan Valley National Wildlife Refuge to avoid FWS lands and then southeast and proceed for about 52 miles through Grant and Hardy Counties, West Virginia before turning due south for about 62 miles through Rockingham and Augusta Counties, Virginia, reconnecting with the proposed route approximately at MP 146.7 near Stuarts Draft (see Figure 10.7.4-1). This route alternative was designed to avoid all USFS lands except for approximately 1.3 miles of the GWNF at the proposed crossing of the Appalachian Trail in Augusta County, Virginia.

The Localized Northern USFS Alternative Route weaves through a number of locations where safe pipeline construction is not possible due to extensive side-slopes and construction space constraints. Specifically, an approximately 16-mile-long stretch of pipeline through Tucker County, West Virginia, which includes the Pleasant Run and Shavers Fork Valleys, areas along the south side of Parsons, areas along the north slope of Backbone Mountain, and areas up the Roaring Run Valley, would not have adequate space to safely construct a pipeline without crossing USFS lands. In addition, an increased number of residential and other developed areas occur along the North Fork Shenandoah River Valley and Capon Run in Rockingham County, Virginia, which could only be avoided by constructing along the side-slopes of Little Mountain or Church Mountain. The constraints in these areas would not permit safe pipeline construction or stable restoration of an alternative route to avoid USFS lands.

In addition to the Parsons area, the Localized Northern USFS Alternative Route would also have to pass through the farming communities and densely developed suburbs of Harrisonburg and Staunton, including the communities of Singer's Glen, Hinton, Mt. Crawford, Mt. Sidney, and Fishersville, to reconnect to the proposed route near Stuarts Draft. These communities are densely farmed and developed and would require the crossing of many more private residential land parcels than the currently proposed route.

The Localized Northern USFS Alternative Route is approximately 170 miles long, which is about 46.3 miles longer than the corresponding segment of the proposed route. This additional pipeline mileage, though shorter than the Northern USFS Alternative Route described above, would increase the area of environmental impact of the ACP by adding 702 acres of temporary construction right-of-way and 421 acres of permanent easement when compared to the proposed route. [28] It would also significantly increase the number of private residences and farms that would be directly affected by the Project. Hydraulic studies also confirmed that the additional 46.3 miles of pipeline crossing this terrain would require incremental compression at the proposed Compressor Station 2 of 15,900 hp. Adding this compression would increase the air emissions at Compressor Station 2 in Buckingham County, Virginia. The additional air emissions that would be associated with this station are provided in Table 10.7.4-3.

The additional incremental cost at Compressor Station 2 would be approximately $64 million. Together with the additional cost relative to the 35-mile increase in the length of the pipeline, estimated to be $322 million, the total added Project cost would be approximately $386 million.

[28] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.

TABLE 10.7.4-3

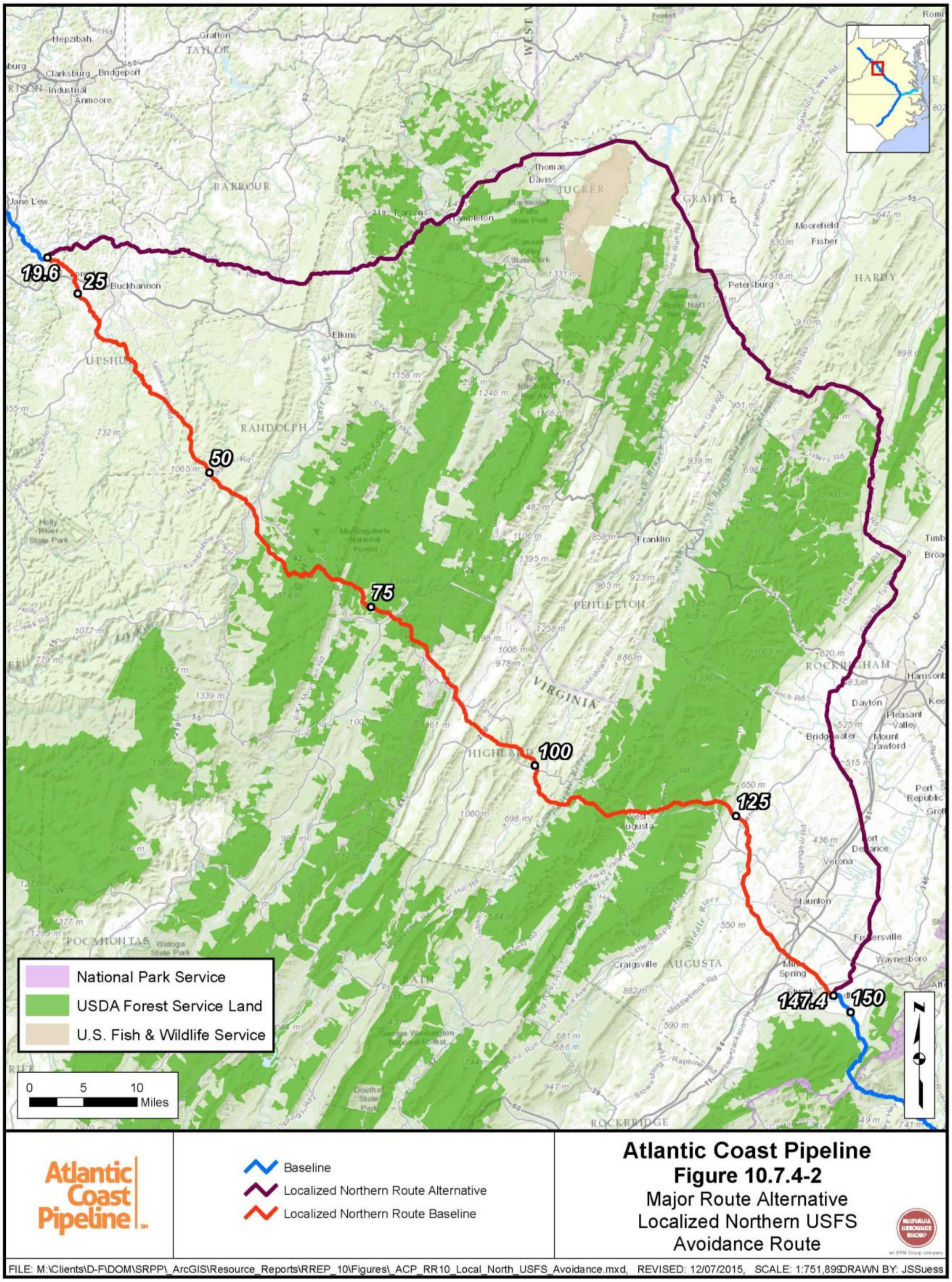
Estimated Air Emissions Associated with an Incremental 15,900 Horsepower at Compressor Station 2 for the Atlantic Coast Pipeline

		Criteria Pollutants (tons per year)						
Combustion Sources	ID	NO_X	CO	VOC	SO_2	PM_f/ PM_{10f}/ $PM_{2.5f}$	PM_c	CO_2e
Compressor Station 2 Baseline Emissions								
Solar Mars 100 Turbine	CT-01	12.3	20.7	1.14	2.12	3.60	8.90	75,094
Solar Taurus 70 Turbine	CT-02	8.35	13.1	0.775	1.43	2.42	5.99	50,511
Solar Taurus 60 Turbine	CT-03	6.28	8.46	0.561	1.08	1.83	4.53	38,201
Solar Centaur 50L Turbine	CT-04	5.20	8.19	0.477	0.894	1.51	3.74	31,627
Boiler	WH-01	2.04	3.43	0.224	0.024	0.078	0.233	4,924
Woods Corner M&R Heaters (4)	LH-01 thru LH-04	3.28	11.0	1.79	0.175	0.420	1.66	35,248
Woods Corner Microturbines (10)	MT-01 thru MT-10	4.03	11.0	0.876	0.102	0.057	0.140	13,364
Fugitive Leaks – Blowdowns	FUG-01	-	-	24.7	-	-	-	21,124
Fugitive Leaks – Piping	FUG-02	-	-	26.7	-	-	-	22,764
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	1.76E-5	-	-		-
Compressor Station 2 Baseline Subtotal		**41.5**	**75.8**	**57.6**	**5.83**	**9.92**	**25.2**	**292,856**
Compressor Station 2 Additional Sources Emissions								
Solar Mars 100 Turbine	CT-01	12.3	20.7	1.14	2.12	3.60	8.90	75,094
Fugitive Leaks – Blowdowns	FUG-01	-	-	5.89	-	-	-	5,032
Fugitive Leaks – Piping	FUG-02	-	-	6.66	-	-	-	5,691
Compressor Station 2 Additional Sources Subtotal		**12.3**	**20.7**	**13.7**	**2.12**	**3.60**	**8.90**	**85,816**
Compressor Station 2 New Total		**53.8**	**96.6**	**71.3**	**7.95**	**13.5**	**34.1**	**378,672**
Percent Increase from Additional Sources		**30%**	**27%**	**24%**	**36%**	**36%**	**35%**	**29%**

* Boiler, Emergency Generator, and Tanks assumed to be the same as ACP-1; fugitive emissions estimated at 25% increase of fugitives at Compressor Station 2 due to the additional turbine

Notes: NO_X = nitrous oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; VOC = volatile organic compounds; PM_f = fine particulate matter; PM_C = course particulate matter; CO_2e =carbon dioxide equivalents

Atlantic further optimized the Localized Northern USFS alternative to provide a more in-depth review of the conceptual route, as well as improve the constructability of the conceptual route. Atlantic then compared digital environmental feature data of the Localized Northern USFS Alternative to the proposed route. A comparison of environmental features crossed by the proposed route and Localized Northern USFS Alternative is provided in Table 10.7.4-4, and the optimized route is shown in Figure 10.7.4-2.



Atlantic Coast Pipeline
Figure 10.7.4-2
Major Route Alternative
Localized Northern USFS
Avoidance Route

TABLE 10.7.4-4

Localized Northern USFS Alternative Route for the Atlantic Coast Pipeline

Features	Unit	Proposed Route	Localized Northern USFS Alternative Route
Length (total)	miles	123.7	170.0
Construction area disturbed (125-ft-wide construction ROW)	acres	1,874	2,575
Primary U.S. or Commonwealth highways crossed	number	26	33
Other Commonwealth or local roads crossed	number	96	155
Adjacent to existing linear corridor facilities	miles	9.0	34.1
Federal lands crossed (total)	miles	28.9	0.3
Monongahela national Forest (USFS)	miles	18.2	0.1
George Washington National Forest (USFS)	miles	10.7	0.2
State/Commonwealth lands crossed	miles	1.7	0.0
West Virginia	miles	1.3	0.0
Huttonsville State Farm Wildlife Management Area	miles	1.3	0.0
Virginia	miles	0.4	0.0
Highland Wildlife Management Area	miles	0.4	0.0
U.S. Forest Service management prescription units crossed (total)	miles	28.9	0.3
Monongahela National Forest	miles	18.2	0.1
Vegetation diversity	miles	7.3	0.0
Spruce and spruce-hardwood ecosystems management	miles	7.3	0.0
Wildlife habitat emphasis	miles	3.6	0.1
George Washington National Forest	miles	10.7	0.2
Mosaics of wildlife habitat	miles	10.7	0.2
Conservation easements crossed (VDOF)	miles	0.0	1.2
Recreational trails crossed	number	40	15
Big-eared bat habitat within the MNF	miles	4.6	0.1
Indiana bat habitat in West Virginia	miles	2.7	0.1
Northern long-eared bat presence area within West Virginia	miles	15.6	40.9
Northern flying squirrel habitat within the MNF	miles	5.4	0.0
Cheat Mountain salamander habitat within the MNF	miles	0.2	0.0
Red spruce crossing percent cover			
Greater than 50 percent cover	miles	0.0	0.6
10 to 50 percent cover	miles	1.4	1.5
10 percent cover	miles	5.0	4.5
Land use types crossed			
Agricultural	miles	33.3	65.0
Developed	miles	2.5	4.0
Forested	miles	86.9	99.6
Open water	miles	0.1	0.4
Mine	miles	0.9	0.9
U.S. Geological Survey karst topography crossed	miles	33.3	46.8
Wetlands crossed – forested/shrub	miles	0.2	0.5
Wetlands crossed – emergent	miles	<0.1	0.2
Wetlands crossed - other	miles	0.1	0.6
Intermittent waterbodies crossed	number	91	140
Perennial waterbodies crossed	number	55	97
Battlefields crossed	miles	4.1	0.0
Planned timber harvest areas within the Monongahela National Forest	miles	0.3	0.0
Roads crossed within the Monongahela National Forest [a]	number	16	0
Trails crossed within the Monongahela National Forest	number	14	2
George Washington National Forest scenic integrity areas crossed (very high or high ranking)	miles	0.3	0.0

TABLE 10.7.4-4 (cont'd)

Localized Northern USFS Alternative Route for the Atlantic Coast Pipeline

Features	Unit	Proposed Route	Localized Northern USFS Alternative Route
George Washington National Forest potential wilderness area crossed	miles	0.1	0.0
Roads crossed within the George Washington National Forest [a]	number	29	16
Trails crossed within the George Washington National Forest	number	5	0
VDOF forest conservation model high ranking areas crossed	miles	19.1	6.1
National Rivers Inventory listed rivers crossed	number	8	5
VDCR scenic rivers – designated scenic rivers crossed	number	0	0
VDCR scenic rivers – qualified or potential scenic rivers crossed	number	1	0
Slope of lands crossed			
0-20 percent	miles	76.2	113.9
20-35 percent	miles	31.0	35.9
35-50 percent	miles	11.4	14.6
50-65 percent	miles	4.0	4.7
Greater than 65 percent	miles	1.1	0.9
USGS Soil Survey Geographic Database			
Prime Farmland crossed [b]	miles	32.2	65.9
Compaction-prone land crossed [c]	miles	1.9	5.8
Hydric soils crossed	miles	1.3	7.8
Highly erodible by water [d]	miles	102.3	131.7
Highly erodible by wind [e]	miles	0.0	0.2
Revegetation concerns [f]	miles	104.3	134.1
Stony soils crossed [g]	miles	103.8	134.3
Hard shallow bedrock crossed [h]	miles	41.7	56.0
Soft shallow bedrock crossed [i]	miles	31.1	42.6

[a] Roads crossed within the Monongahela and George Washington National Forests are based upon roads layers provided by the USFS. These data layers include roads that cross a portion of USFS land but extend outside of the USFS land boundary.

[b] As designated by the Natural Resources Conservation Service.

[c] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[d] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[e] Includes soils with Wind Erodibility Group classification of one or two.

[f] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[g] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[h] Includes soils that have bedrock within 60 inches of the soil surface. Hard bedrock refers to lithic bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

[i] Includes soils that have bedrock within 60 inches of the soil surface. Soft bedrock refers to paralithic bedrock that will not likely require blasting during construction.

Table 10.7.4-4 shows in greater detail the specific issues with this route alternative. The route alternative does decrease the length of USFS lands crossed to 0.3 miles, which is 28.6 miles less than the baseline route[29]. Along with this reduction in USFS lands, the route alternative reduces impacts to a number of the resources that are of concern to the USFS, such as recreational trails, big-eared bat habitat, Indiana bat habitat, northern flying squirrel habitat, and Cheat Mountain salamander habitat, and roads crossed within the USFS. The route alternative also reduces crossing of VDOF forest conservation model high ranking areas.

[29] Note that utilization of this route alternative would still require the crossing of about 1.1 miles of the George Washington National Forest located near the Blue Ridge Parkway.

However, in order to reduce the crossing of USFS lands with a subsequent reduction in impacts to USFS-specific resources, significant increases in impacts to environmental resources located on privately owned lands would be caused by the additional 46.3 miles of pipeline that would be required by the Localized Northern USFS route alternative, which would result in the disturbance during construction of an additional approximately 701 acres of land (based on a typical construction right-of-way width of 125 feet). These increased impacts would include 12.7 more miles of forested lands, 1.2 more miles of VDOF conservation easement lands, 13.5 more miles of USGS karst topography, 25.3 more miles of northern long-eared bat habitat, 0.6 more mile of greater than 50 percent red spruce cover areas, 49 more intermittent and 42 more perennial waterbodies, and 3.7 more miles of slopes greater than 35 percent.

In addition, Atlantic compared the baseline and alternative routes using the Soil Survey Geographic (SSURGO) database from the USDA Natural Resources Conservation Service (NRCS). This comparison shows that the Localized Northern USFS route alternative would cause an increased crossing of 33.7 miles prime farmland soils, 3.9 miles more compaction-prone soils, 6.5 miles more hydric soils, 29.4 miles more highly erodible soils by water, 0.2 miles more highly erodible soils by wind, 29.8 miles more soils with revegetation concerns, 30.5 miles more stony/rocky soils, 14.3 more soils with hard shallow bedrock (i.e., less than five feet of soil cover), and 11.5 miles more soft shallow bedrock. Of the SSURGO soils that would be crossed by this route, the most concerning are those soils that are highly erodible by water, the areas containing soils that have a greater potential to be problematic during revegetation of the right-of-way, and the right-of-way areas containing hard shallow bedrock within the pipeline trench depth. When compared to Atlantic's proposed route through the USFS lands, the Localized Northern USFS Alternative Route contains 28.7 percent greater amounts of soils that are highly erodible by water, 28.6 percent more soils that could pose revegetation problems, and 34.3 percent more right-of-way areas containing hard shallow bedrock within the pipeline trench depth. Utilization of this route would result in more areas with a higher erosion and sedimentation potential during construction, greater concerns with revegetation during restoration of the right-of-way following construction and more areas of hard shallow bedrock will likely require more blasting or other specialized construction techniques in order to install the pipeline

For all the reasons discussed above, the Localized Northern USFS Alternative Route offers more environmental disadvantages when compared to the proposed AP-1 mainline and therefore was not adopted as part of the proposed route.

Localized Southern USFS Alternative Route

To avoid most USFS lands by going south of ACP's currently proposed route, a Localized Southern USFS Alternative Route was identified that would originate near MP 51.7 of the AP-1 mainline in Randolph County, West Virginia. This alternative route would head south for approximately 31 miles through Randolph and Pocahontas Counties, before turning southwest for approximately 54 miles through Pocahontas and Greenbrier Counties, West Virginia. On the south side of Ronceverte, West Virginia, the route alternative would head southeast for approximately 13 miles, and then meander through Monroe County, West Virginia, and Alleghany and Botetourt Counties, Virginia for 39 miles. It then would proceed northeast through Botetourt, Rockbridge, and Augusta Counties, Virginia for approximately 53 miles,

where it would reconnect with the proposed route at approximate MP 152.5 near Sherando, Virginia (see Figure 10.7.4-3). This alternative route would avoid all USFS lands except for approximately 1.3 miles of the GWNF at the proposed crossing of the Appalachian Trail in Augusta County, Virginia. A comparison of environmental features crossed by the proposed route and Localized Southern USFS alternative is provided in Table 10.7.4-6.

In order to avoid the USFS lands south of the proposed route, the Localized Southern USFS Alternative Route would have to cross substantial areas requiring steep side-slope construction. Beginning near the Monroe and Alleghany County border, heading along the Snake Run Valley, and then crossing Peters Mountain, this route alternative would require approximately 10 miles of side-slope construction or the pipeline would need to be located along the ridgeline within USFS lands. After crossing Peters Mountain, an approximately 5.5-mile section through the Potts Creek Valley would require multiple crossing of Potts Creek and Highway 18, as well as the crossing of residential and other developments within the Potts Creek Valley heading to Covington, Virginia. Finally, an additional 6-mile stretch of side-slope construction would be required along the north side of Patch Mountain. These three sections would result in approximately 22 miles of pipeline within Alleghany County that would require working in unsafe conditions during pipeline construction, a substantially increased construction footprint, and a high potential for increased slips and landslides and potential damage to streams to avoid USFS lands.

In addition to the construction constraints described above, the Localized Southern USFS Alternative Route would be approximately 195.8 miles long, which is about 103.2 miles longer than the corresponding segment of the proposed route. This additional pipeline mileage is longer than the Southern USFS Alternative Route, and would increase the area of environmental impact of the ACP by adding 1,564 acres of temporary construction right-of-way and 938 acres of permanent easement when compared to the proposed route. [30] This route alternative was an attempt to minimize the additional length of pipeline when compared to the Southern USFS Avoidance Alternative Route while still reducing USFS land crossings. Due to the contiguously connected USFS lands south of the proposed route it was not possible to avoid USFS lands and add fewer than 89 miles of additional pipeline in the Localized Southern USFS Alternative Route when compared to the proposed route.

In addition to the increased length of the pipeline, hydraulic studies also confirmed that the additional 103.2 miles of pipeline would require an additional 26,440 hp (two 13,220-hp units) at a new compressor station located somewhere between proposed Compressor Stations 1 and 2. The additional air emissions associated with this additional 26,440 hp of compression are provided in Table 10.7.4-5.

[30] These estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline.

TABLE 10.7.4-5

Estimated Air Emissions Associated with an Additional Compressor Station (26,440 horsepower) for the Atlantic Coast Pipeline

		Criteria Pollutants (tons per year)						
Combustion Sources	ID	NO_X	CO	VOC	SO_2	PM_f/ PM_{10f}/ $PM_{2.5f}$	PM_C	CO_2e
Solar Mars 90 Turbine	CT-01	10.5	18.1	1.83	1.80	3.06	7,.57	66,265
Solar Mars 90 Turbine	CT-02	10.5	18.1	1.83	1.80	3.06	7.57	66,265
Caterpillar G3516C emergency generator	EG-01	0.116	0.451	0.123	0.0004	0.0279	0.007	129
Boiler	WH-01	2.30	3.86	0.253	0.028	0.087	0.262	5,546
Fugitive Leaks – Blowdowns	FUG-01	-	-	12.9	-	-	-	11,060
Fugitive Leaks – Piping	FUG-02	-	-	20.1	-	-	-	17,142
Accumulator Tank	TK-1	-	-	0.350	-	-	-	-
Hydrocarbon (Waste Oil) Tank	TK-2	-	-	1.76E-05	-	-	-	-
Total		**23.3**	**40.6**	**37.4**	**3.62**	**6.23**	**15.4**	**166,407**

* Boiler, Emergency Generator, and Tanks assumed the same as ACP Compressor Station1; fugitive leaks emissions estimated at 3/4 the level of ACP Compressor Station 1.

Notes: NO_X = nitrous oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; VOC = volatile organic compounds; PM_f = fine particulate matter; PM_C = course particulate matter; ; CO_2e =carbon dioxide equivalents

For the Southern USFS Avoidance Alternative Route, the additional cost relative to the increase in the length of the pipeline would be $819 million, and the additional cost for the new compressor station would be approximately $132 million. The total added Project cost would be approximately $951 million.

Atlantic further optimized the Localized Southern USFS alternative to provide a more in-depth review of the conceptual route, as well as improve the constructability of the conceptual route. Atlantic then compared digital environmental feature data of the Localized Southern USFS Alternative to the proposed route. A comparison of environmental features crossed by the proposed route and Localized Southern USFS Alternative is provided in Table 10.7.4-6, and the optimized route is shown in Figure 10.7.4-3.

Table 10.7.4-6 shows in greater detail the specific issues with the route alternative. The Localized Southern USFS route alternative does decrease the length of USFS lands crossed to 1.1 miles, which is 27.8 miles less than the baseline route. Along with this reduction in USFS lands, the route alternative reduces impacts to a number of the data layers that are specific to the USFS, such as USFS management prescription units, recreational trails, big-eared bat habitat, Indiana bat habitat, northern flying squirrel habitat, and Cheat Mountain salamander habitat. The route alternative also reduces crossing of VDOF forest conservation model high ranking areas, and The Nature Conservancy forest core priority habitat.

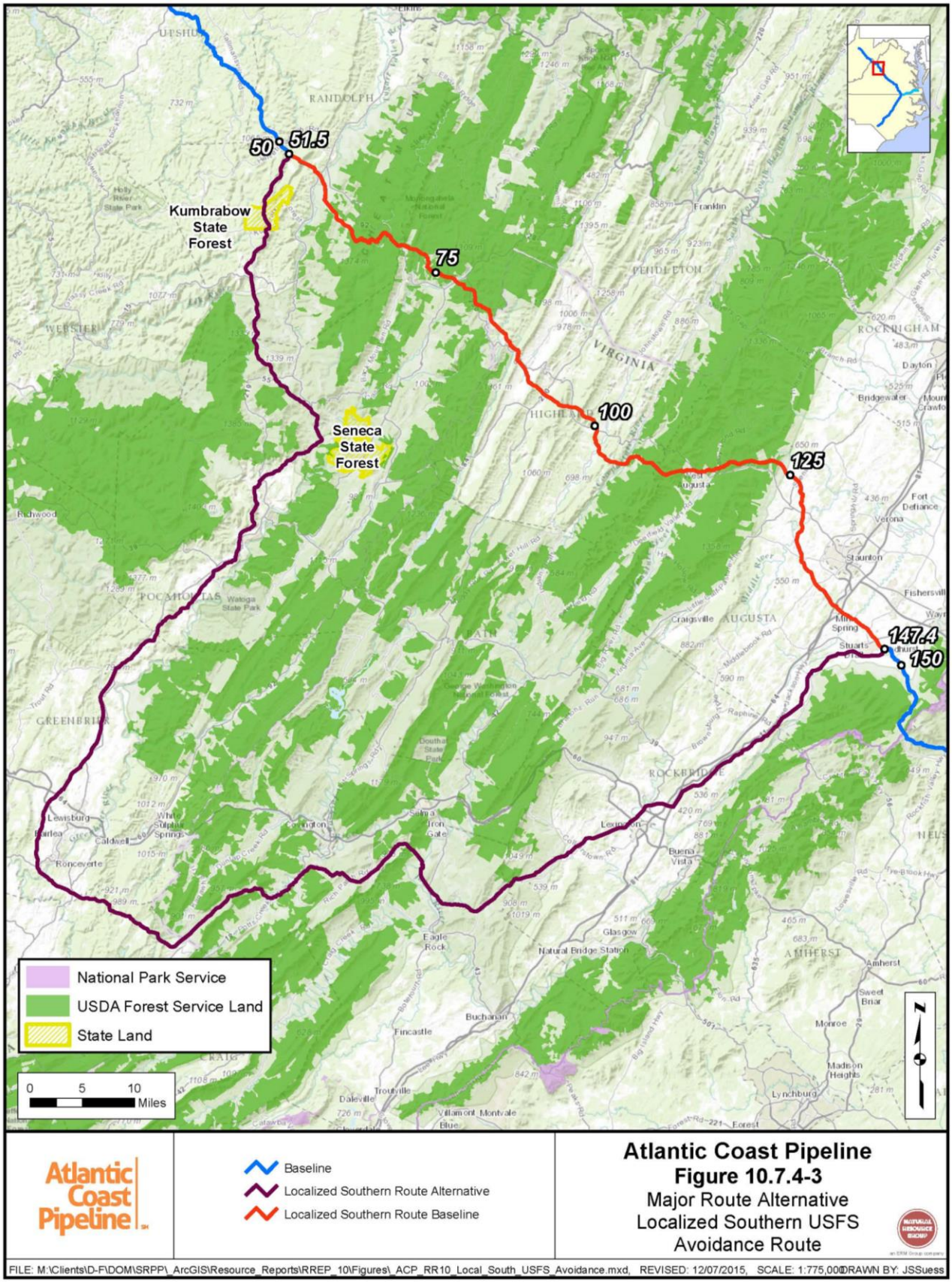

50
51.5
75
100
125
147.4
150
Kumbrabow State Forest
Seneca State Forest
RANDOLPH
PENDLETON
VIRGINIA
POCAHONTAS
GREENBRIER
ROCKBRIDGE
AUGUSTA
AMHERST
National Park Service
USDA Forest Service Land
State Land
0 5 10 Miles
N
Atlantic Coast Pipeline
Baseline
Localized Southern Route Alternative
Localized Southern Route Baseline
Atlantic Coast Pipeline
Figure 10.7.4-3
Major Route Alternative
Localized Southern USFS
Avoidance Route
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TABLE 10.7.4-6

Localized Southern USFS Alternative Route for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Localized Southern USFS Alternative Route
Length (total)	miles	92.6	195.8
Construction area disturbed (125-ft-wide construction ROW)	acres	1,403	2,966
Primary U.S. or Commonwealth highways crossed	number	23	37
Other Commonwealth or local roads crossed	number	69	171
Adjacent to existing linear corridor facilities	Miles	8.6	21.6
Federal lands crossed (total)	miles	28.9	1.1
Monongahela national Forest (USFS)	miles	18.2	0.0
George Washington National Forest (USFS)	miles	10.7	1.1
State/Commonwealth lands crossed	miles	1.7	4.3
West Virginia	miles	1.3	3.9
Huttonsville State Farm Wildlife Management Area	miles	1.3	0.0
Slaty Fork Wildlife Management Area	miles	0.0	0.2
Kumbrabow State Forest	miles	0.0	3.7
Virginia	miles	0.4	0.4
Highland Wildlife Management Area	miles	0.4	0.0
Cowbane Prairie Natural Preserve Area	miles	0.0	0.4
U.S. Forest Service management prescription units crossed (total)	miles	18.2	1.1
Monongahela National Forest	miles	18.2	0.0
Vegetation diversity	miles	7.3	0.0
Spruce and spruce-hardwood ecosystems management	miles	7.3	0.0
Wildlife habitat emphasis	miles	3.6	0.0
George Washington National Forest	miles	10.7	1.1
Mosaics of wildlife habitat	miles	10.7	1.1
Conservation easements crossed (VDOF)	miles	0.0	8.5
Recreational trails crossed	number	39	7
Big-eared bat habitat within the MNF	miles	4.6	0.0
Indiana bat habitat in West Virginia	miles	2.7	0.0
Northern long-eared bat presence area within West Virginia	miles	15.6	61.3
Northern flying squirrel habitat within the MNF	miles	5.4	0.0
Cheat Mountain salamander habitat within the MNF	miles	0.2	0.0
Red spruce crossing percent cover			
Greater than 50 percent cover	miles	0.0	0.0
10 to 50 percent cover	miles	1.4	2.8
10 percent cover	miles	5.0	2.8
Land use types crossed			
Agricultural	miles	27.8	60.1
Developed	miles	1.8	3.9
Forested	miles	63.0	130.6
Open water	miles	0.1	0.1
Mine	miles	0.0	1.0
U.S. Geological Survey karst topography crossed	miles	33.3	121.2
Wetlands crossed – forested/shrub	miles	0.2	0.1
Wetlands crossed – emergent	miles	<0.1	0.1
Wetlands Crossed - other	miles	0.1	0.2
Intermittent waterbodies crossed	number	77	143
Perennial waterbodies crossed	number	43	75
Battlefields crossed	miles	4.1	0.0
Planned timber harvest areas within the Monongahela National Forest	miles	0.3	0.0
Roads crossed within the Monongahela National Forest [a]	number	16	0
Trails crossed within the Monongahela National Forest	number	14	0

TABLE 10.7.4-6 (cont'd)
Localized Southern USFS Alternative Route for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	Localized Southern USFS Alternative Route
George Washington National Forest scenic integrity areas crossed (very high or high ranking)	miles	0.3	0.0
George Washington National Forest potential wilderness area crossed	miles	0.1	0.0
Roads crossed within the George Washington National Forest [a]	number	29	61
Trails crossed within the George Washington National Forest	number	5	0
VDOF forest conservation model high ranking areas crossed	miles	19.1	18.5
The Nature Conservancy critical habitat			
Forest core priority interior habitat	miles	16.7	6.1
Natural cover within active river areas	miles	0.8	0.4
Natural communities within resilient areas	miles	2.6	5.6
National Rivers Inventory listed rivers crossed	number	7	7
VDCR scenic rivers – designated scenic rivers crossed	number	0	0
VDCR scenic rivers – qualified or potential scenic rivers crossed	number	1	1
Slope of lands crossed			
0-20 percent	miles	58.0	109.6
20-35 percent	miles	21.3	55.5
35-50 percent	miles	8.6	22.3
50-65 percent	miles	3.6	6.8
Greater than 65 percent	miles	1.0	1.5
USGS Soil Survey Geographic Database			
Prime Farmland crossed [b]	miles	23.0	69.7
Compaction-prone land crossed [c]	miles	1.2	2.6
Hydric soils crossed	miles	1.2	5.2
Highly erodible by water [d]	miles	73.2	160.6
Highly erodible by wind [e]	miles	0.0	0.4
Revegetation concerns [f]	miles	75.3	161.0
Stony soils crossed [g]	miles	74.6	149.6
Hard shallow bedrock crossed [h]	miles	33.3	66.4
Soft shallow bedrock crossed [i]	miles	13.3	42.5

[a] Roads crossed within the Monongahela and George Washington National Forests are based upon roads layers provided by the USFS. These data layers include roads that cross a portion of USFS land but extend outside of the USFS land boundary.

[b] As designated by the Natural Resources Conservation Service.

[c] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[d] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[e] Includes soils with Wind Erodibility Group classification of one or two.

[f] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[g] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[h] Includes soils that have bedrock within 60 inches of the soil surface. Hard bedrock refers to lithic bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

[i] Includes soils that have bedrock within 60 inches of the soil surface. Soft bedrock refers to paralithic bedrock that will not likely require blasting during construction.

However, in order to avoid or significantly reduce the crossing of USFS lands, significant increases in impacts to environmental resources located on privately owned lands would be caused by the additional 103.2 miles of pipeline that would be required by the Localized Southern USFS route alternative. This would result in the disturbance during construction of an additional approximately 1,563 acres of land disturbance (based on a typical construction right-of-way width of 125 feet). These increased impacts would include 67.6 more miles of forested lands, 8.5 more miles of VDOF conservation easement lands, 87.9 more miles of USGS karst

topography, 45.7 more miles of northern long-eared bat habitat, 66 more intermittent and 32 more perennial waterbodies, and 17.4 more miles of land with greater than 35 percent slope.

Similar to the Localized Northern USFS Alternative Route, Atlantic compared the baseline and alternative routes using the SSURGO database from the USDA NRCS. Of the SSURGO soils that would be crossed, the most concerning are those soils that are highly erodible by water, the areas containing soils that have a greater potential to be problematic during revegetation of the right-of-way, and the right-of-way areas containing hard shallow bedrock within the pipeline trench depth. When compared to Atlantic's proposed route through the USFS lands, the Localized Northern USFS Alternative Route contains 119 percent greater amounts of soils that are highly erodible by water, 114 percent more soils that could pose revegetation problems, and 99 percent more right-of-way areas containing hard shallow bedrock within the pipeline trench depth. Utilization of this route would result in more areas with a higher erosion and sedimentation potential during construction, greater concerns with revegetation during restoration of the right-of-way following construction and more areas of hard shallow bedrock will likely require blasting or other specialized construction techniques in order to install the pipeline.

For all the reasons discussed above, the Localized Southern USFS Alternative Route offers many more environmental disadvantages when compared to the proposed AP-1 mainline and therefore was not adopted as part of the proposed route.

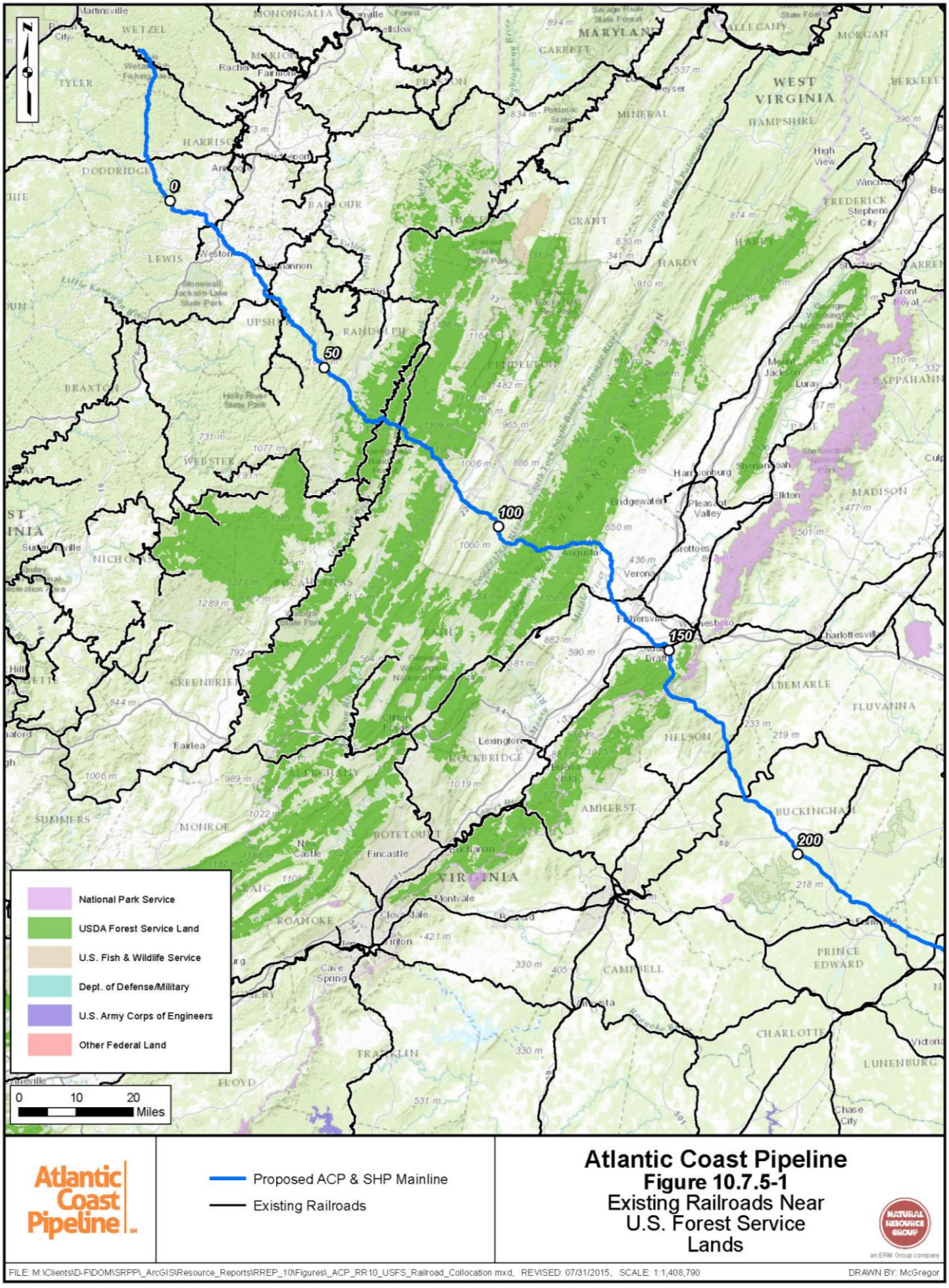
10.7.5 Adjacent to Existing Railroads

In a letter dated April 27, 2015, the USFS requested an analysis of potential collocation route alternatives which follow existing railroad corridors. Atlantic reviewed the location of existing railroad corridors near all USFS lands. As shown in Figure 10.7.5-1, the existing railroads near USFS lands in West Virginia and Virginia mostly are oriented primarily northeast to southwest, while the proposed ACP is oriented primarily northwest to the southeast. Therefore, Atlantic determined that there are no feasible alternatives adjacent to railroads in these areas.

10.8 MAJOR ROUTE ALTERNATIVES – EXCEPTS FROM FULL REPORT

10.8.1.1 Eastern and Western Route Alternatives

During the initial planning stages for the ACP, Atlantic identified and evaluated two conceptual route alternatives: an eastern route alternative and a western route alternative. As shown on Figure 10.8.1-1, both routes originate south of Clarksburg in West Virginia and terminate near Lumberton in North Carolina, with laterals extending to Hampton Roads in Virginia and Clayton in North Carolina. Comparative information on each route is provided in Table 10.8.1-1.


0
50
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National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
Dept. of Defense/Military
U.S. Army Corps of Engineers
Other Federal Land
0 10 20
Miles
Atlantic Coast Pipeline
Proposed ACP & SHP Mainline
Existing Railroads
Atlantic Coast Pipeline
Figure 10.7.5-1
Existing Railroads Near
U.S. Forest Service
Lands
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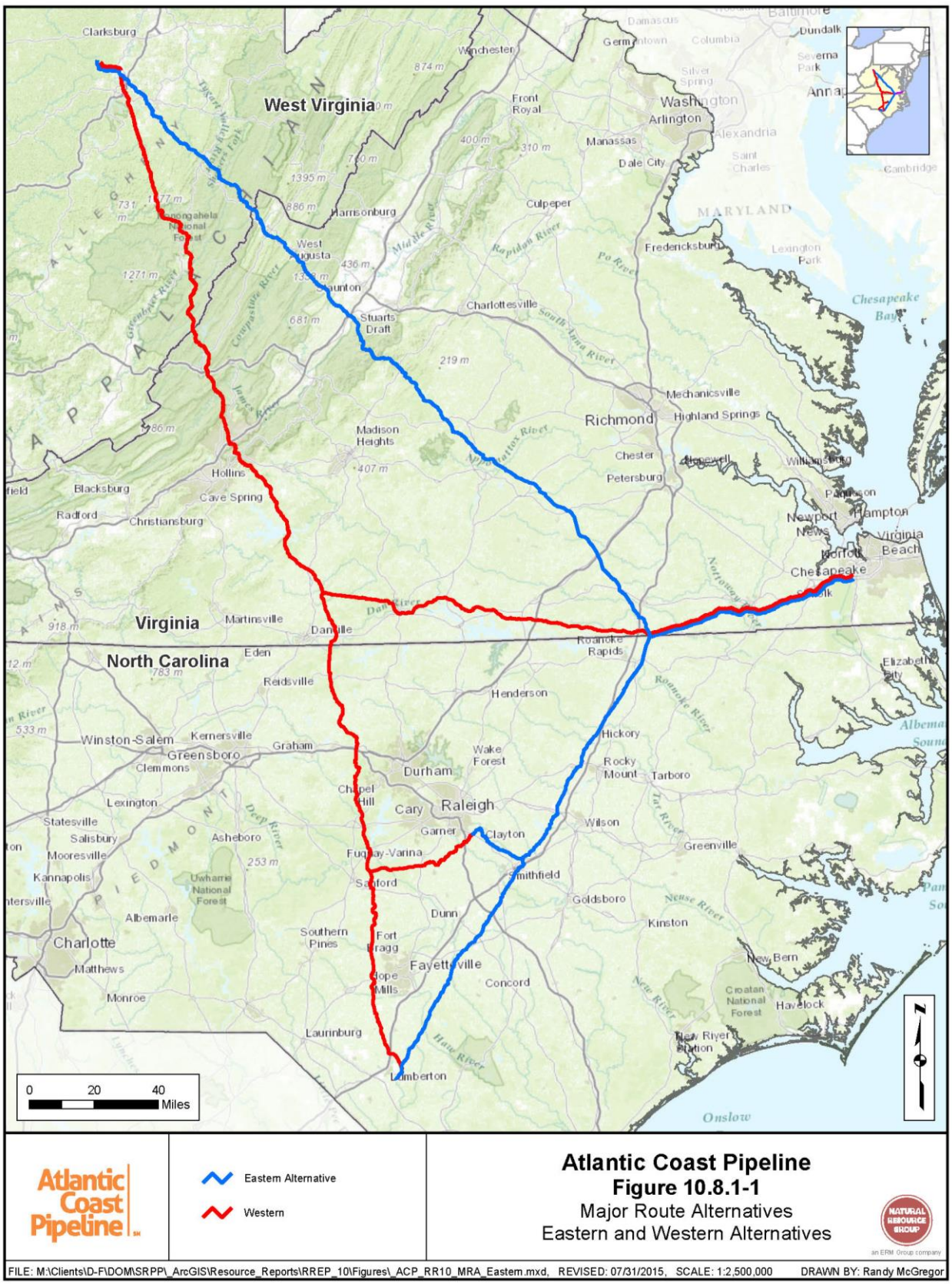
West Virginia
Virginia
North Carolina
Eastern Alternative
Western
0 20 40 Miles
Atlantic Coast Pipeline
Figure 10.8.1-1
Major Route Alternatives
Eastern and Western Alternatives
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TABLE 10.8.1-1

Eastern and Western Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Eastern Route [a]	Western Route
Length	miles	538.0	607.2
Primary U.S. or State/Commonwealth highways crossed	number	115	103
Adjacent to existing linear corridor facilities	miles	22.6	16.8
Federal lands crossed (total)	miles	66.4	68.4
National Park Service	miles	0.6	0.4
U.S. Forest Service	miles	46.9	44.0
U.S. Fish and Wildlife Service	miles	7.2	7.2
U.S. Army	miles	11.7	14.0
U.S. Army Corps of Engineers	miles	0.0	2.8
Blue Ridge Parkway crossings	number	1	1
Appalachian Trail crossings	number	1	1
State/Commonwealth lands crossed (total)	miles	2.8	7.0
West Virginia	miles	0.0	0.0
Virginia	miles	0.2	0.0
North Carolina	miles	2.6	7.0
Conservation easements crossed	miles	12.2	18.3
Forested lands crossed	miles	328.8	414.7
National Wetland Inventory wetlands crossed (total)	miles	60.7	45.7
Forested	miles	55.0	40.1
Emergent	miles	4.7	4.0
Other	miles	1.0	1.6
Intermittent waterbodies crossed	number	342	481
Perennial waterbodies crossed	number	362	425
Historic properties, historic landscapes, and historic landmarks crossed	miles	13.5	10.4

[a] The eastern route alternate is similar, but not identical, to the baseline route for the ACP. The eastern route alternative was refined into the baseline route based on customer needs and identification of delivery points for the ACP.

The eastern route alternative, including the laterals, measures approximately 538.0 miles in length, of which 22.6 miles is adjacent to existing linear corridor facilities. It crosses approximately 66.4 miles of Federal lands, including lands managed by the USFS, FWS, U.S. Army, and NPS. The eastern route crosses both the Blue Ridge Parkway and Appalachian Trail on Federal lands. The route crosses 2.8 miles of State/Commonwealth lands, 12.2 miles of conservation easements, 328 miles of forested land, 60.6 miles of wetland, and 362 perennial waterbodies. It additionally crosses 13.5 miles of areas identified as historic properties, historic landscapes, or historic landmarks, consisting mostly of Civil War battlefields.

The western route alternative, including the laterals, measures approximately 607.2 miles in length, of which 16.8 miles is adjacent to existing linear corridor facilities. The route crosses 68.4 miles of Federal lands, including lands managed by the USFS, FWS, U.S. Army, U.S. Army Corps of Engineers, and NPS. Like the eastern route alternative, the western route crosses both the Blue Ridge Parkway and Appalachian Trail on Federal lands. It crosses 7.0 miles of State/Commonwealth lands, 18.3 miles of conservation easements, 414.7 miles of forested lands, 45.7 miles of wetland, and 425 perennial waterbodies. It also crosses 10.4 miles of areas identified as historic properties, historic landscapes, or historic landmarks, mostly Civil War battlefields.

Relative to the eastern route alternative, the western route alternative is approximately 69.2 miles longer and crosses 2.0 more miles of Federal lands, including lands managed by the U.S. Army Corps of Engineers, which the eastern route avoids. Both routes cross the Blue Ridge Parkway and Appalachian Trail on Federal lands. The western alternative crosses 4.2 more miles of State/Commonwealth land and 6.1 more miles of conservation easements than the eastern alternative. The western alternative crosses 15.0 miles less of wetland and 3.1 miles less of historic places, but 85.9 more miles of forested land and 63 more perennial waterbodies than the eastern route.

In addition, after the receipt and delivery points were confirmed for the ACP, it was determined that the western route alternative does not provide a direct connection to the delivery point in Randolph, County, West Virginia (i.e., the Long Run M&R Station), or to the receipt and delivery point in Buckingham County, Virginia (i.e., Compressor Station 2). Additional laterals would need to be built to reach these locations if the western route was selected as the preferred alternative. Depending on the routes selected, these laterals would add an additional 75 to 85 miles of pipeline to the ACP, which would result in greater environmental impact and additional cost.

For all these reasons, Atlantic identified the eastern route as the preferred alternative for the ACP. This route subsequently was refined into the baseline route for the ACP.

10.8.1.2 Monongahela National Forest Major Route Alternatives

The MNF encompasses approximately 919,000 acres of Federal lands in the north-central highlands of West Virginia. It is a biologically and geographically diverse area managed by the USFS for a number of uses, including recreation, wilderness and habitat, delivery of high-quality water, mineral extraction, timber production, and livestock grazing. The MNF contains eight federally designated Wilderness Areas, as well as backcountry recreation areas, special biological areas, a national recreation area, and visually sensitive areas (USFS, 2014b).

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the MNF altogether (see Section 10.7.4 above). In addition to the baseline route, however, several alternative routes or conceptual corridors were identified and evaluated in an effort to avoid or minimize crossings of sensitive resources within the forest. These resources include scenic areas, backcountry recreation areas, habitat for sensitive species (e.g., West Virginia northern flying squirrel and Cheat Mountain salamander), botanical areas, forest areas containing a medium to high percentage of red spruce cover, and Civil War battlefield sites. Atlantic considered alternative routes or conceptual corridors extending either north and east or south and east of the baseline as well as variations of the baseline across the MNF. Alternatives were developed based on consultations with MNF staff and through review of the *Monongahela National Forest Land and Resource Management Plan* (USFS, 2011) and geographic information system (GIS) data layers provided by USFS staff. Evaluations of the alternatives are provided in the subsections below.

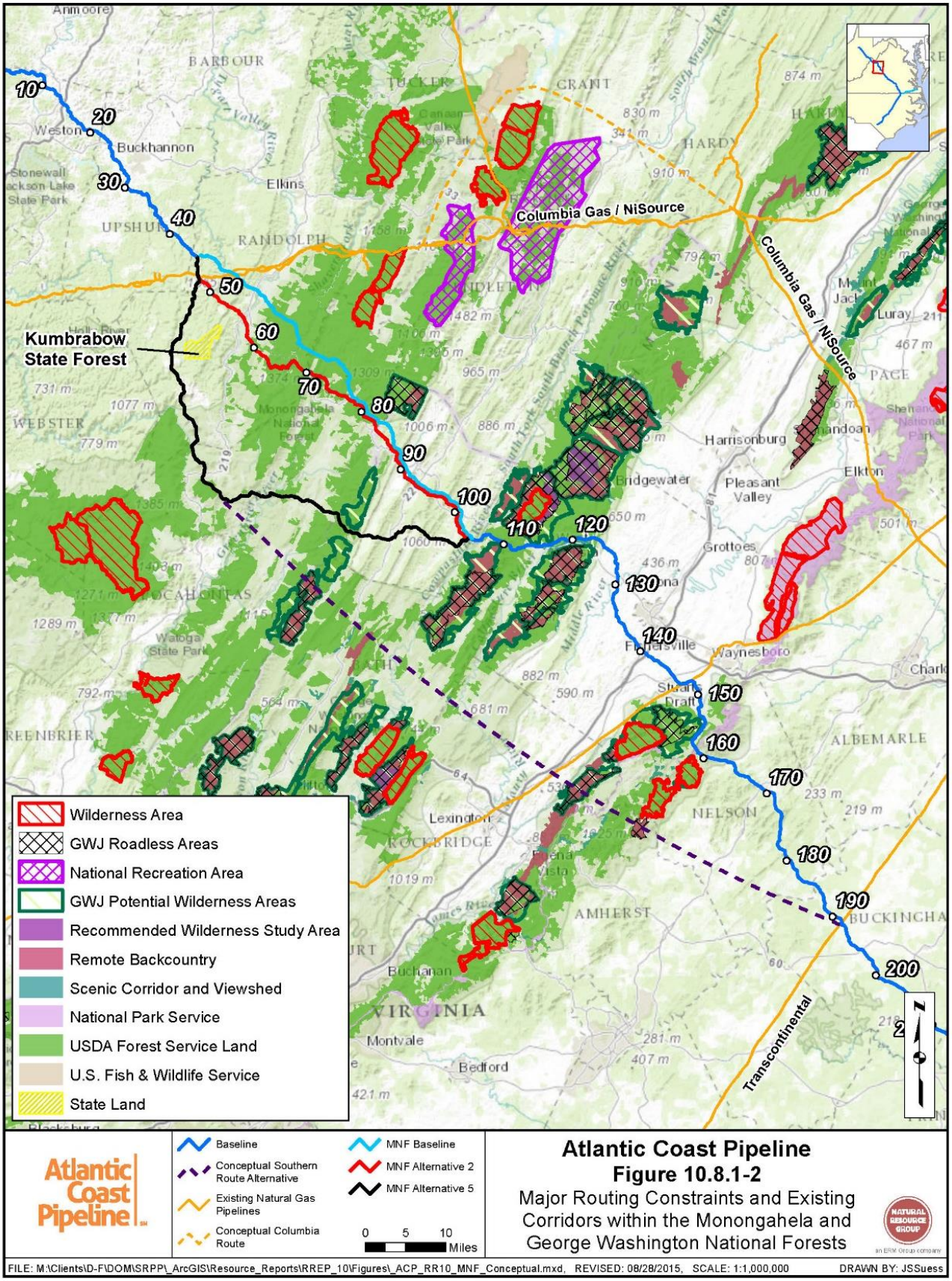
Northern and Eastern Route Alternatives

Conceptually, Atlantic considered heading east and north of its baseline crossing of the MNF in an effort to avoid sensitive resources within the forest. A potential routing opportunity considered was an alternative route parallel and adjacent to the existing Columbia system (see Figure 10.8.1-2 and the discussion above in Section 10.7.1.1). Several issues were identified, however, which preclude use of this existing corridor as a viable alternative route. As discussed in more detail in Section 10.7.3.2 above, collocation or partial utilization of the existing Columbia corridor is not feasible due to space constraints and rugged topography along the corridor where it crosses the MNF. Most of the existing Columbia corridor in this area contains three pipelines of 26- or 36-inch-diameter. Because this corridor crosses very rugged terrain where space for safe and stable pipeline construction is limited, there is insufficient room for a new 42-inch pipeline along or adjacent to the existing corridor. As a result, the AP-1 mainline would need to be routed along a new right-of-way, which would eliminate the benefits of collocation with an existing utility, such as reduced forest clearing.

Another issue with this alternative is that the existing Columbia corridor crosses or passes near several sensitive management areas, including the Laurel Fork North, Otter Creek, Roaring Plains, and Dolly Sods Wilderness Areas; the Spruce Knob-Seneca Rocks NRA, and backcountry recreation areas (see Figure 10.8.1-2). The Columbia corridor is adjacent to the northern boundary of the Laurel Fork North Wilderness Area for 2.4 miles, and crosses approximately 11.4 miles of the NRA. An alternate greenfield route extending at least 15 miles to the north of the Columbia system would be necessary to avoid the Wilderness Areas, NRA, and backcountry recreation areas, and the route would need to cross Canaan Valley National Wildlife Refuge. The alternate route (the "Conceptual Columbia Route depicted on Figure 10.8.1-2) would add an additional 227 acres of temporary impact and 136 acres of new permanent right-of-way to the Project. [31]

As noted above, Wilderness Areas are significant constraints, requiring an authorization from the President or Congress for a natural gas pipeline crossing. If such authorization could be obtained at all, it would be infeasible to obtain within the timeframe required by the purpose and need of the Projects. A route further to the south to avoid the sensitive management areas would be located near the baseline and cross many of the same resources, such as habitat for sensitive species, backcountry recreation areas, and forest areas with a medium to high percentage of red spruce cover.

[31] This assumes that the alternate route would increase the length of the AP-1 mainline by approximately 15 miles relative to the proposed route. The acreage estimates are based on a 125-foot-wide construction right-of-way and 75-foot-wide permanent easement for the AP-1 mainline


Columbia Gas / NiSource
Columbia Gas / NiSource
Kumbrabow State Forest
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160
170
180
190
200
Wilderness Area
GWJ Roadless Areas
National Recreation Area
GWJ Potential Wilderness Areas
Recommended Wilderness Study Area
Remote Backcountry
Scenic Corridor and Viewshed
National Park Service
USDA Forest Service Land
U.S. Fish & Wildlife Service
State Land
Baseline
Conceptual Southern Route Alternative
Existing Natural Gas Pipelines
Conceptual Columbia Route
MNF Baseline
MNF Alternative 2
MNF Alternative 5
0 5 10 Miles
Atlantic Coast Pipeline
Figure 10.8.1-2
Major Routing Constraints and Existing Corridors within the Monongahela and George Washington National Forests
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Finally, an alternative route to the north and east following a similar path as the existing Columbia corridor would eventually have to proceed south to reconnect with Atlantic's proposed route heading southeast. A significant routing constraint that would have to be crossed is the SNP, which extends from Waynesboro, Virginia northeast to Front Royal, Virginia, a distance of approximately 70 miles, much of which is designated Wilderness Area. A crossing of the SNP would require an authorization from the U.S. Congress and a crossing of a Wilderness Area would require an authorization from the President (as discussed above). If such authorizations could be obtained at all, it would be infeasible to obtain them within the timeframe required by the purpose and need of the Projects.

For all the reasons described above, attempts to identify potential route corridors to the north and east of Atlantic's proposed route across the MNF were abandoned.

MNF Baseline Route and Alternatives

Atlantic identified and evaluated two alternative routes (MNF 1 and MNF 2) in an effort to avoid sensitive resource areas within the MNF along the baseline, including the Gaudineer Scenic Area and a backcountry recreation area. Both routes are south of and generally parallel to the baseline, crossing Cheat and Back Allegheny Mountains south of U.S. Highway 250. MNF 1 was identified first, and then approximately 20 percent of this route (about 9.0 miles) was modified and optimized to create MNF 2, which avoids sensitive habitats identified in GIS data sets provided by USFS staff.

The baseline route measures approximately 56.4 miles in length. Starting at MP 44.6, the route initially heads east/southeast for approximately 11.7 miles, passing south of Nettle Mountain, and crossing Rich Mountain and the Tygart Valley. It enters the MNF approximately 2.5 miles southeast of Mill Creek in Pocahontas County, West Virginia, and then continues east/southeast for approximately 23.8 miles, crossing Cheat, Back Allegheny, Burner, and Frank Mountains. The route exits the MNF near the West Virginia/Virginia State/Commonwealth line west of Tamarack Ridge. It then continues in a southeasterly direction for approximately 20.9 miles, crossing Bearcamp Knob, Lantz Mountain, Bluegrass Valley, and Jack Mountain. It terminates south of McDowell on Bullpasture Mountain in Highland County, Virginia, approximately at MP 104.5.

Beginning at MP 44.6, MNF 1 initially extends to the southeast of the baseline for approximately 16.7 miles, passing south of Huttonsville and entering the MNF at Cheat Mountain. It then heads east/southeast for 13.1 miles, crossing Cheat, Back Allegheny, and Burner Mountains. After crossing the East Fork of the Greenbrier River, the route follows the same alignment as the baseline for 5.2 miles across Frank Mountain and Little Spruce Ridge. It then passes south of the baseline for approximately 3.3 miles to avoid a conservation easement at Bearcamp Knob. MNF 1 then follows the same alignment as the baseline to the terminus, approximately at MP 104.5.

MNF 2 initially follows the same alignment as MNF 1 for the first 18.8 miles. At Cheat Mountain, it deviates away from MNF 1, following a former strip mine for approximately 4.7 miles across Cheat and Back Allegheny Mountains. It then parallels U.S. Highway 250 for

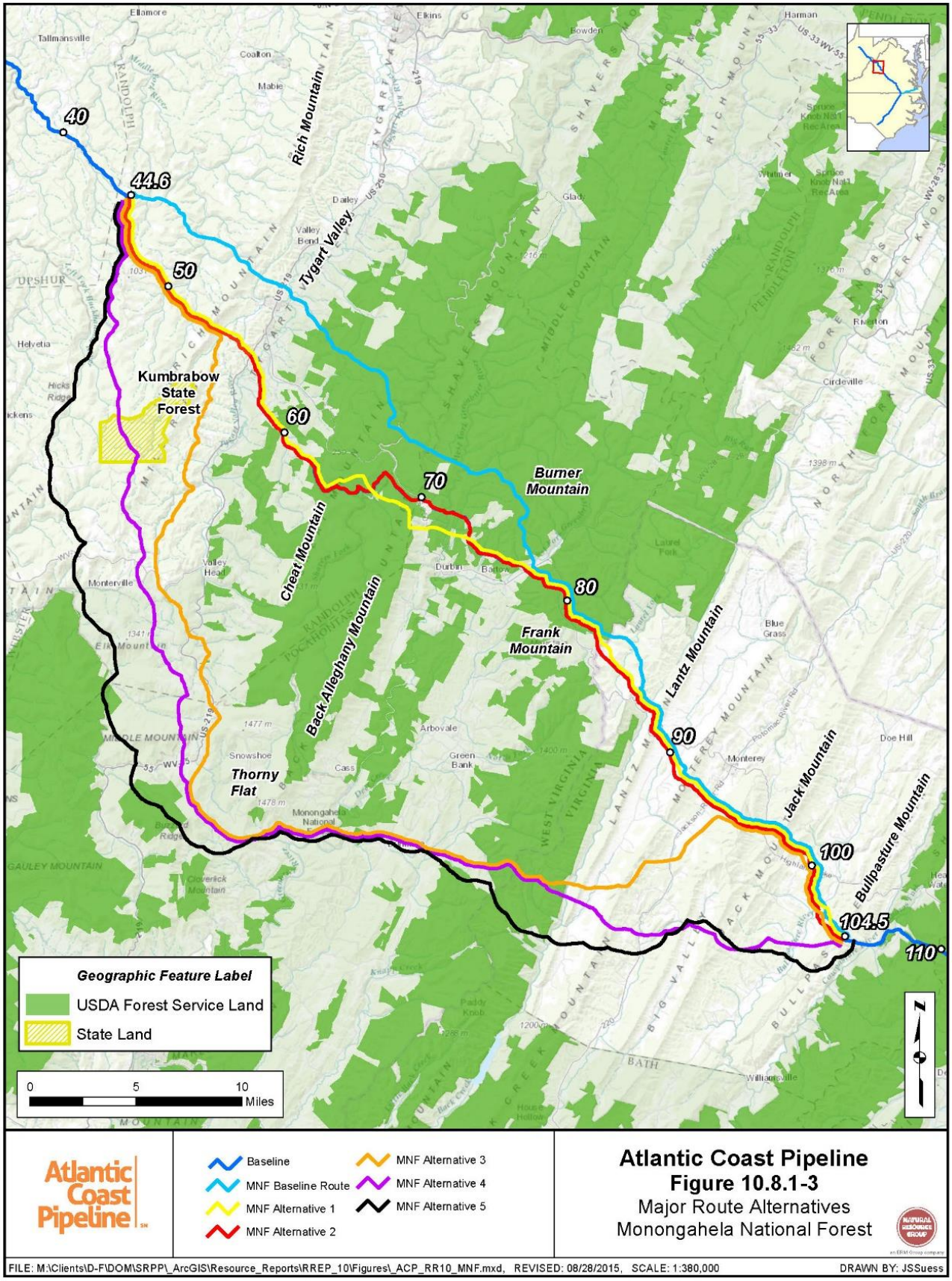
1.3 miles, before heading east/southeast for 3.9 miles across Burner Mountain. MNF 2 then follows the same alignment as MNF 1 to the terminus, approximately at MP 104.5.

Figure 10.8.1-3 depicts the baseline and alternative routes, and Table 10.8.1-2 provides comparative data on each route. MNF 1 and MNF 2 are approximately the same length as the baseline, but they reduce the crossing length of the MNF by 7.0 and 5.1 miles, respectively. This primarily is due to the routes following a mix of cleared agricultural and forested private lands between approximately MPs 55.6 and 60.6 across the Tygart Valley and along Becky Creek before entering Federal lands in the MNF. Both alternatives cross 1.8 miles of State/Commonwealth-owned lands, compared to 0.4 mile for the baseline. The alternatives avoid crossings of conservation easements on private lands, whereas the baseline crosses 2.3 miles of conservation easement at Bearcamp Knob.

Relative to the baseline, MNF 1 and MNF 2 cross approximately 0.8 and 2.1 more miles, respectively, of lands identified by the USGS as karst topography. However, MNF 1 and MNF 2 each reduce crossings of high ranking forest areas identified in a Virginia Department of Forestry (VDOF) forest conservation model by 0.4 mile. MNF 1 and MNF 2 additionally cross 2.0 and 5.1 miles less of forest core priority interior habitat areas as identified by The Nature Conservancy, and both routes cross 3.6 miles less of forested land as identified in the USGS's National Gap Analysis Program Land Cover Data than the baseline.

The major optimization of MNF 1 to MNF 2 was accomplished by adjusting the latter route to follow a bench along the side of Cheat Mountain that was used during the mid- to late-twentieth century for strip mining of coal. The bench consists of a stabilized and previously graded, relatively flat, side-cut area measuring approximately 150 feet wide. It follows along the south side of an east-west trending ridgeline north of Lambert Run between Cheat and Back Allegheny Mountains about at the 4,000-foot contour. The bench is relatively flat, rocky, and covered by grass or shrubs. Portions of the bench are in the process of being replanted with red spruce seedlings by the USFS and private stakeholder groups.

Starting approximately at MP 62.5, MNF 2 follows the previously mined and graded strip mine bench for a distance of approximately 4.7 miles through areas mapped by the MNF as red spruce forest and potential habitat for West Virginia northern flying squirrel. Relative to the baseline and MNF 1, MNF 2 optimizes existing, cleared, or very recently replanted corridors within the MNF. Atlantic's engineers have reviewed aerial photography and topographic maps of this area and flown along the route. Based on this desktop and aerial review, MNF 2 appears to be a constructible route that would avoid significant tree clearing as well as areas of steep slope along Cheat and Back Allegheny Mountains. Moreover, based upon review of aerial photography, MNF 2 crosses approximately 3.8 miles less of forested land than MNF 1 in the area where it follows the former strip mine.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104.5
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Rich Mountain
Tygart Valley
Kumbrabow State Forest
Burner Mountain
Cheat Mountain
Back Allegheny Mountain
Frank Mountain
Lantz Mountain
Jack Mountain
Bullpasture Mountain
Thorny Flat
Geographic Feature Label
USDA Forest Service Land
State Land
0 5 10 Miles
Baseline
MNF Baseline Route
MNF Alternative 1
MNF Alternative 2
MNF Alternative 3
MNF Alternative 4
MNF Alternative 5
Atlantic Coast Pipeline
Figure 10.8.1-3
Major Route Alternatives
Monongahela National Forest
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TABLE 10.8.1-2

Monongahela National Forest Major Route Alternatives for the Atlantic Coast Pipeline [a]

Features	Unit	Baseline Route	MNF 1	MNF 2 [b]	MNF 3	MNF 4	MNF 5
Length (total)	miles	56.4	55.7	56.8	74.3	67.6	73.0
Land crossed with slope greater than 35 percent	miles	8.7	8.7	9.5	20.1	13.7	14.7
Primary U.S. or State/Commonwealth Highway	number	10	11	11	10	9	9
Other State/Commonwealth or local roads	number	18	18	21	18	27	19
Adjacent to existing linear corridor facilities (total)	miles	0.0	0.0	1.0	3.8	1.7	0.7
Federal lands crossed (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
U.S. Forest Service (total)	miles	23.0	16.0	17.9	5.2	5.3	8.0
Monongahela National Forest	miles	23.0	16.0	17.9	2.2	2.2	4.8
George Washington National Forest	miles	0.0	0.0	0.0	3.0	3.1	3.2
State/Commonwealth lands crossed (total)	miles	0.4	1.7	1.7	0.5	4.8	1.6
West Virginia	miles	0.0	1.3	1.3	0.1	3.5	0.1
Virginia	miles	0.4	0.4	0.4	0.4	1.3	1.5
Private lands crossed	miles	33.0	38.0	37.2	68.6	57.5	63.4
Conservation easements crossed	miles	2.3	0.0	0.0	2.1	0.0	0.0
U.S. Forest Service management prescription units crossed							
Vegetation diversity	miles	11.6	5.7	7.1	0.0	0.0	1.7
Spruce and spruce-hardwood ecosystems management	miles	5.4	6.4	6.9	0.0	0.0	0.0
Wildlife habitat emphasis	miles	4.8	3.7	3.7	2.2	2.2	2.6
Backcountry recreation	miles	1.0	0.0	0.0	0.0	0.0	0.5
Special areas – scenic areas	miles	0.3	0.0	0.0	0.0	0.0	0.0
Mosaics of wildlife habitat (George Washington National Forest)	miles	0.0	0.0	0.0	3.0	3.1	3.2
Big-eared bat habitat	miles	4.6	4.8	4.5	0.0	0.0	0.0
Indiana bat habitat	miles	0.9	1.9	2.5	0.6	0.6	2.4
Northern long-eared bat presence area	miles	18.2	14.5	15.1	26.8	27.5	28.4
Northern flying squirrel habitat	miles	5.6	4.7	5.2	0.0	0.0	0.0
Cheat Mountain salamander habitat	miles	2.4	2.2	0.2	0.0	0.0	0.0
Red spruce crossing percent cover							
Greater than 50 percent cover	miles	0.8	0.9	0.0	0.0	0.0	0.0
10 to 50 percent cover	miles	3.5	1.4	1.1	0.0	0.8	0.5
10 percent cover	miles	5.1	6.2	5.5	1.1	1.6	2.0
No spruce present	miles	16.9	16.3	19.4	12.8	28.8	16.9
Land use types crossed							
Agricultural	miles	5.1	7.9	8.9	7.8	8.6	4.8
Developed	miles	0.5	0.5	0.6	0.7	0.8	0.7
Forested	miles	50.8	47.2	47.2	65.9	58.1	66.6
Open water	miles	0.0	0.1	0.1	0.0	0.0	0.1
Mine	miles	0.0	0.0	0.0	0.0	0.0	0.9
U.S. Geological Survey karst topography crossing	miles	7.7	8.5	9.8	19.9	25.1	27.5
Recreational trails crossed	number	21	16	36	21	20	18
Wetlands crossed – forested	miles	0.0	0.1	0.1	<0.1	<0.1	0.1
Wetlands crossed – emergent	miles	<0.1	0.0	0.0	0.0	0.0	<0.1
Wetlands crossed – other	miles	0.1	0.1	0.1	<0.1	<0.1	<0.1
Intermediate waterbodies crossed	number	25	29	27	48	35	22
Perennial waterbodies crossed	number	20	27	30	30	19	25
Battlefield areas (total)	miles	0.7	1.7	3.4	1.0	0.0	0.0
McDowell	miles	0.7	0.7	0.7	0.7	0.0	0.0
Cheat Mountain	miles	0.0	0.9	2.6	0.3	0.0	0.0
Planned timber harvest areas within the Monongahela National Forest	miles	0.3	0.2	0.2	0.0	0.0	0.0

TABLE 10.8.1-2 (continued)

Monongahela National Forest Major Route Alternatives for the Atlantic Coast Pipeline [a]

Features	Unit	Baseline Route	MNF 1	MNF 2 [b]	MNF 3	MNF 4	MNF 5
Roads crossed within the Monongahela National Forest	number	17	11	12	3	3	3
Trails crossed within the Monongahela National Forest [c]	number	13	6	24	13	13	11
George Washington National Forest potential wilderness areas crossed	miles	0.0	0.0	0.0	3.0	3.0	0.0
Roads crossed within the George Washington National Forest	number	5	5	5	7	5	6
Trails crossed within the George Washington National Forest	number	0	0	0	0	0	0
VDOF forest conservation model high ranking areas crossed	miles	6.1	5.7	5.7	7.6	7.9	10.0
The Nature Conservancy critical habitat							
Forest core priority interior habitat crossed	miles	17.8	15.8	12.7	1.4	0.0	0.0
Natural cover within active river areas crossed	miles	0.9	0.8	0.8	0.3	0.3	0.3
Natural communities within resilient areas crossed	miles	4.6	1.8	1.8	4.0	3.9	5.2
National Rivers Inventory listed river	number	6	6	6	4	4	3
VDCR scenic rivers – designated scenic rivers crossed	number	0	0	0	0	0	0
VDCR scenic rivers – qualified or potential scenic rivers crossed	number	1	1	1	0	0	0
FWS IPAC unofficial threatened and endangered species listed within 300 feet of the project segment	number	9	9	9	8	8	8
Slope of lands crossed							
0-20 percent	miles	31.3	29.9	29.0	32.7	34.3	37.8
20-35 percent	miles	16.7	17.1	18.2	21.5	19.6	20.6
35-50 percent	miles	7.2	6.5	7.4	13.9	10.1	10.8
50-65 percent	miles	1.4	1.8	1.8	5.0	3.0	3.4
Greater than 65 percent	miles	0.1	0.4	0.3	1.2	0.6	0.5

[a] All six routes are entirely within a National Radio Quiet Zone associated with the Green Bank Telescope in the town of Green Bank, West Virginia. Potential impacts on the quite zone are still being evaluated.

[b] The MNF 2 route alternative has continued to be modified through the incorporation of Route Adjustments in response to field survey results. Route adjustments incorporated into the MNF 2 route are listed in Table 10.10-1 of Resource Report 10.

[c] A trail labeled "strip mine" within the MNF trails data provided by the USFS runs parallel to the MNF 6 baseline route for approximately 2.1 miles and crosses the trail numerous times. Therefore the actual number of trail crossings is less than shown

In addition to following the bench, MNF 2 runs adjacent to an approximately 1.0-mile-long section of U.S. Route 250 on the northeast side of Back Allegheny Mountain and the south side of Blister Run. Relative to the baseline and MNF 1, this routing maximizes collocation with an existing corridor.

Several digital environmental resource data layers provided by USFS staff were reviewed to evaluate the alternative routes across the Cheat/Back Allegany Mountain area of the MNF. These include suitable and high probability habitat for the West Virginia northern flying squirrel, habitat for Cheat Mountain salamander, a special botanical area (Blister Run Swamp), a spruce restoration area (Lambert Spruce Restoration Area), a potential wild and scenic river crossing, and red spruce cover. Salient points relative to these data layers include the following:

Suitable and High Probability Habitat for the West Virginia Northern Flying Squirrel

Atlantic understands that suitable habitat for northern flying squirrel generally occurs at elevations greater than 3,000 feet, on north facing slopes, in red spruce and mixed red spruce/northern hardwood forest, and adjacent areas with these characteristics. Northern flying

squirrels also may be found at micro-sites dominated by northern hardwoods, along drainages, particularly with a strong hemlock component, and at elevations below 3,000 feet.

Both MNF 1 and MNF 2 cross areas mapped as suitable or high potential habitat for the West Virginia northern flying squirrel. Unlike the baseline route and MNF 1, MNF 2 mostly crosses these areas within or adjacent to existing, previously cleared corridors. These include the former strip mine areas (graded bench) along the east-west trending ridgeline north of Lambert Run and the area adjacent to U.S. Route 250 (which itself is separated from the main forested habitat area on Back Allegheny Mountain by an adjacent, cleared power line corridor). The former strip mine areas are mostly cleared of trees, and based on this fact, do not appear to provide high quality habitat for northern flying squirrel. [32] Much of this area occurs at elevations of 4,000 feet or less, on the south facing slope of the ridgeline, and/or areas mapped as containing no or less than 10 percent red spruce cover.

Habitat for Cheat Mountain Salamander

Both the baseline and MNF 1 routes cross areas mapped by the USFS as habitat for Cheat Mountain salamander along Back Allegheny Mountain. MNF 1 crosses 2.2 miles of mapped habitat areas, including areas on Cheat Mountain. MNF 2 avoids mapped habitat areas on Cheat Mountain, but crosses 0.2 mile of mapped habitat area on Grassy Knob off Little Spruce Ridge. [33]

Blister Run Swamp Botanical Area

The baseline, MNF 1, and MNF 2 avoid the Blister Run Swamp Botanical Area, though MNF 2 is adjacent to this area where the route parallels U.S. Highway 250.

Lambert Spruce Restoration Area

Both MNF 1 and MNF 2 cross the Lambert Spruce Restoration Area along the east-west trending ridgeline north of Lambert Run. Unlike MNF 1, MNF 2 mostly crosses this area within previously cleared former strip mines. Atlantic understands that the USFS, in collaboration with different stakeholders, has begun a process to reclaim these areas by planting red spruce tree seedlings. Because the former strip mines are not yet reforested, however, construction across the former strip mines would significantly reduce clearing of mature forest and minimize forest fragmentation in this area. Moreover, although MNF 2 crosses some areas that have been replanted, Atlantic would restore these areas in the temporary construction right-of-way with additional red spruce plantings following construction, with age, density, and genetic variation of seedlings to be determined by the USFS. Additionally, Atlantic will work with USFS staff to identify measures for mitigating impacts in the permanent right-of-way easement, such as: reducing the width of the permanent easement; by replanting seedlings within the temporary construction right-of-way to restore or maintain mammalian connectivity across the right-of-

[32] Atlantic has conducted habitat assessments for northern flying squirrel along the proposed route and provided the survey results to the FERC and USFS.

[33] Atlantic has conducted presence/absence surveys for the Cheat Mountain salamander within characteristic habitat areas along the proposed route and provided the results to the FERC and USFS. Atlantic is currently addressing USFS comments on the survey report.

way; and/or by replanting and restoring adjacent or offsite areas within the MNF with red spruce plantings. The intent of the mitigation would be to ensure no net loss of red spruce forest or restoration areas.

Potential Wild and Scenic Rivers

The baseline, MNF 1, and MNF 2 each cross an area which is mapped as a potential wild and scenic river along Shavers Fork. Atlantic believes that impacts on Shavers Fork could be mitigated through implementation of best management practices during construction (including implementation of the Commission's *Wetland and Waterbody Construction and Mitigation Procedures*, which are USFS-approved, and the West Virginia Department of Environmental Protection's *Erosion and Sediment Control Best Management Practice Manual*) as well as by restoration of the right-of-way.

Red Spruce Cover

The baseline route crosses large areas mapped as containing medium (10-50 percent) and high (>50 percent) red spruce cover on Back Allegheny Mountain. MNF 1 and MNF 2 mostly cross areas mapped as containing no or low red spruce cover on Back Allegheny Mountain. MNF 2 crosses the least amount of high and medium red spruce cover across Back Allegheny Mountain because it follows the former strip mine, which is mapped as having no red spruce cover present. MNF 2 additionally avoids areas mapped as containing medium or high spruce cover on Cheat Mountain.

Battlefield Areas

Compared to the baseline route, MNF 1 and MNF 2 cross an additional 0.9 and 2.6 miles, respectively, in battlefield areas. However, Atlantic understands that a good portion of these areas have been previously disturbed through mining or other activities, and are not intact. [34]

Based on review of digital desktop data and discussions with USFS staff, Atlantic believes that MNF 2 has the potential to avoid or minimize impacts on sensitive resources within the MNF. Atlantic applied for and received a temporary use permit from the MNF to access MNF lands for the purposes of conducting environmental field surveys, including surveys for sensitive habitats, species, and cultural resource sites, along MNF 2. Atlantic has and continues to provide survey reports to the FERC and USFS as surveys and reports are completed.

Southern Route Alternatives

After consultation with staff at the MNF, the West Virginia Field Office of the FWS, and the West Virginia Department of Natural Resources, three routes to the south of Atlantic's MNF 2 alternative were identified and evaluated. These include alternative routes MNF 3, MNF 4, and MNF 5. The intent of these route alternatives was to reduce the crossing length of the MNF and avoid sensitive resources in the Cheat/Back Allegheny Mountain area, particularly

[34] Atlantic has conducted a cultural resources survey of the proposed route across the MNF and provided the survey results to the FERC and USFS. Atlantic is currently addressing USFS comments on the survey report.

habitat for West Virginia northern flying squirrel and Cheat Mountain salamander. Figure 10.8.1-3 depicts the baseline and alternative routes, and Table 10.8.1-2 provides comparative data on the three alternatives.

The alternative routes leave the baseline at MP 44.6 following the same path as MNF 2 until reaching MP 47.6 (MNF 3 and MNF 4) or 53.9 (MNF 5). MNF 3, 4, and 5 then proceed due south for between 27.0 and 34.0 miles, turning east just south of the Snowshoe Ski Area at Thorny Flat, West Virginia. The routes then proceed east past Dunmore, West Virginia for approximately 15.8 miles, crossing the West Virginia/Virginia State/Commonwealth border east of Dunmore, West Virginia. From here, MNF 3 proceeds to the northwest for 10.3 miles, and then follows the same path as the baseline to approximate MP 104.5. MNF 4 and 5 continue east for approximately 15.0 miles to the terminus of the routes. MNF 3, 4, and 5 are longer than the corresponding segments of the baseline and its variant routes, adding between 11.2 and 17.9 miles of route relative to the baseline.

MNF 3, 4, and 5 cross 2.2 miles, 2.2 miles, and 4.8 miles, respectively, of the MNF, compared with 23.0 miles for the baseline and 16.0 miles and 17.9 miles, respectively, for MNF 1 and MNF 2. MNF 3, 4, and 5 cross between 3.0 and 3.2 miles of the GWNF in areas managed for wildlife habitat. MNF 3 and 4, however, are in areas identified in the *George Washington National Forest Revised Land and Resource Management Plan* (GWNF LRMP) (USFS, 2014a) as potential wilderness areas.

In addition to adding substantial mileage to the ACP, there are several other disadvantages and challenges associated with MNF 3, 4, and 5. First and foremost is the difficulty of the terrain crossed by these routes, particularly in the areas west, south, and east of Snowshoe/Thorny Flat and at the points where the alternative routes reconnect to the proposed pipeline route. Of particular significance along the southern routes is the jumbled arrangement of ridgetops in the area surrounding Thorny Flat. The mountain ridges in this area generally run in a north/south direction (the AP-1 mainline trends northwest to southeast) or have no primary orientation and consist of a jumbled mass of peaks and ridge tops.

Crossing the difficult terrain along MNF 3, 4, or 5 with a 42-inch-diameter pipeline while attempting to minimize or avoid traversing steep side slopes would result in multiple, steeply graded, up-and-down approaches to ridgetops that would in many instances require heavy equipment winching on both sides of the ridge from single or multiple staging areas on the ridge top. In identifying possible routes south of the MNF, Atlantic tried to find alternative routes that minimize steep slopes where excessive equipment winching (i.e., lowering down and/or hauling up) would be required. For the construction of a 42-inch-diameter pipeline, a large class of construction equipment (e.g., bulldozers, trackhoes, and side boom tractors) would be required to safely work and carry the pipe joints and move the fabricated pipeline sections. Areas where this class of equipment would likely require winching are ridges and hills where slopes exceed 35 percent. While slopes exceeding 50 percent are occasionally traversed on the proposed route, including within the MNF along MNF 2, Atlantic tried to reduce the number and occurrence of these steep slopes while routing to the south to the greatest extent possible due to construction safety, slope stability, and right-of-way restoration concerns.

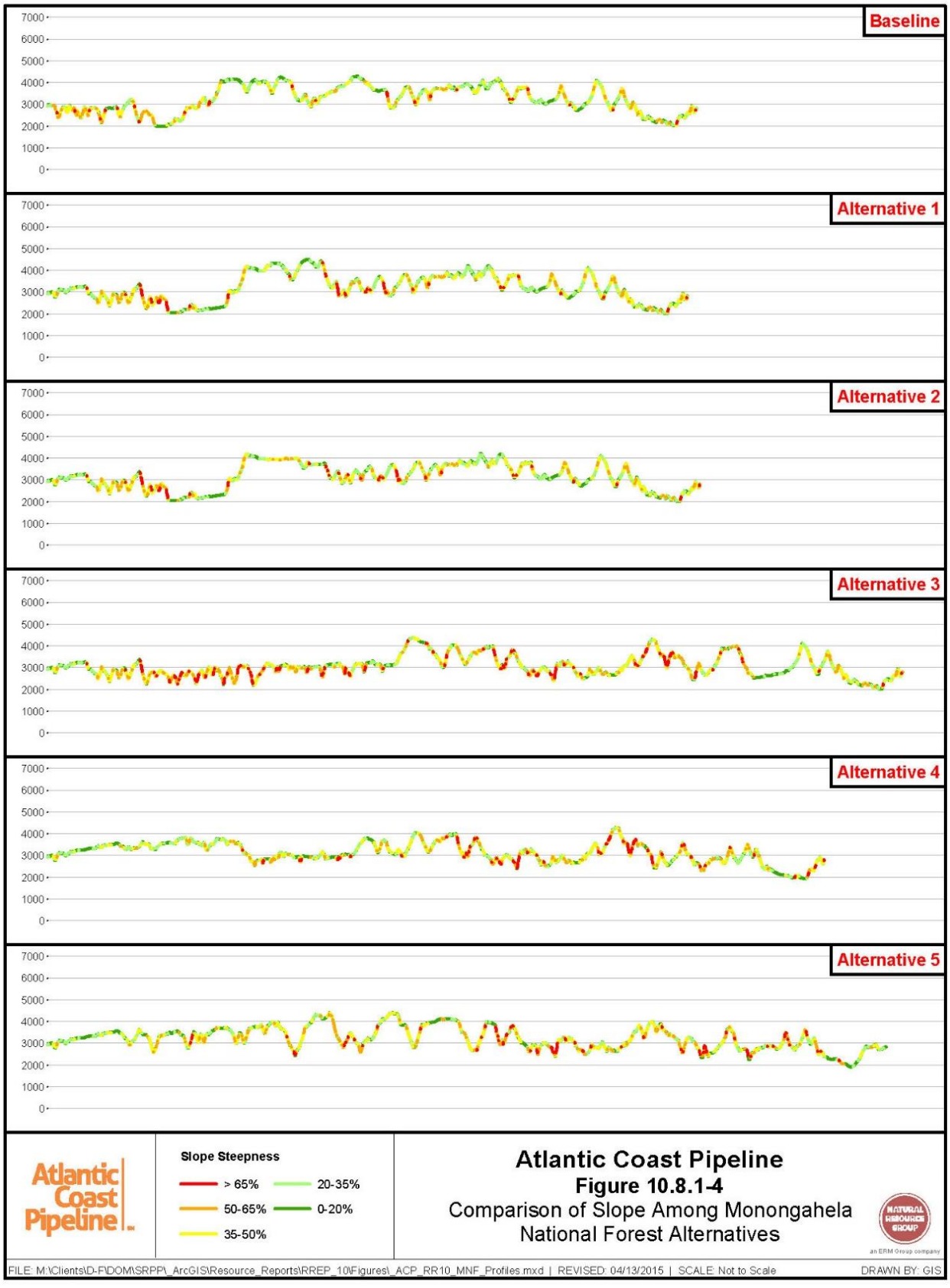
While the corresponding section of the baseline route crosses slopes exceeding 35 percent for a distance of approximately 8.7 miles, MNF 3, 4, and 5 cross slopes exceeding 35 percent for 20.1 miles, 13.7 miles, and 14.7 miles, respectively. Figure 10.8.1-4 provides a profile of slopes crossed along all the MNF route alternatives. As discussed in Resource Report 1, special construction methods, including use of winched tractors and other vehicles, are necessary in areas where the slope exceeds 35 percent.

Because of the narrowness and remoteness of the ridgetops, most of these areas would require the construction of a graded winching platform on top of the ridge, and depending on the slope, could require construction of an access road along the ridge to access the winch platform for delivery of construction equipment and pipe sections. Access to the remote areas crossed by the three southern alternative routes would be difficult due to the lack of existing nearby roads (see below), which could require the construction of new roads into these areas. Slope restoration and stabilization would also be difficult to achieve in many of the steep areas crossed by the southern alternative routes.

The lack of existing roads along the southern alternatives is a significant and limiting constraint for MNF 3, 4, and 5. A general rule of thumb for pipeline construction is to provide ingress and egress points along the right-of-way approximately at 1-mile intervals wherever feasible. To quantify the lack of roads along the alternative routes, Atlantic measured the total length of each route where there are no crossings of public roads within a mile along the route. For the southern route alternatives, there are approximately 15.8 miles, 10.5 miles, and 22.5 miles, respectively, where there are no crossings of public roads within a mile along the MNF 3, MNF 4, and MNF 5 routes. By contrast, there are approximately 6.8 miles of MNF 2 where there are no crossings of public roads within a mile of the route. For these reasons, more and longer access roads would need to be built along the southern alternative routes relative to MNF 2.

In addition to the constraints described above, MNF 3, 4, and 5 cross approximately 19.9, 25.1, and 27.5 miles, respectively, of lands classified by the USGS as potentially containing karst terrain. Each of these lengths is longer than the baseline, MNF1, and MNF 2 alternatives, which cross 7.7, 8.5, and 9.8 miles of potential karst terrain, respectively. These results indicate greater potential for impacts on karst along MNF 3, 4, and 5 relative to the other routes.

Based on desktop review and aerial reconnaissance of the three southern alternative routes (MNF 3, 4, and 5), Atlantic's engineers concluded that MNF 5 would be the least difficult to construct and re-stabilize of the three routes, although it would be significantly more difficult than either MNF 1 or MNF 2. Additionally, MNF 5 avoids the portion of the GWNF identified in the GWNF LRMP (USFS, 2014a) as potential wilderness area. However, even with the avoidance of this land, the aggregation of the terrain and accessibility on MNF 5 makes this route difficult from a construction standpoint.


Baseline
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
7000
6000
5000
4000
3000
2000
1000
0
Slope Steepness
> 65%
50-65%
35-50%
20-35%
0-20%
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.8.1-4
Comparison of Slope Among Monongahela National Forest Alternatives
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To gauge how much more difficult construction of MNF 5 would be than MNF 2, Atlantic performed a detailed slope evaluation of the entire study area, and quantified for comparison purposes the length of very steep slope (i.e., greater than 45 percent) along the centerline of these routes. This comparison is shown on Figure 10.8.1-5. Note that both profiles have a vertical exaggeration of 10:1 to highlight changes in elevation. Additionally, refer to Appendix 10B for a detailed topographic map set which provides a breakdown of slope along a 300-foot-wide study corridor for MNF 2 and MNF 5 (Note – the construction right-of-way will only require 125 feet). To provide a further indication of the difficulty of constructing MNF 5, Table 10.8.1-3 provides a detailed listing of the construction issues and concerns associated with this route.

In addition to construction, access, and restoration/stabilization issues, the greater length required for the three southern alternative routes (MNF 3, 4, and 5) would result in significant additional land disturbance and forest clearing. For example, in addition to MNF 5 adding 16.6 miles to the Project relative to the baseline route, it also crosses 15.8 more miles of forested lands than the corresponding segment of the baseline and 19.4 more miles of forested land than MNF 2. Assuming a construction right-of-way width of 125 feet, this would result in the clearing and grading of an additional 238.5 acres of forested land compared with the baseline or an additional 293.9 acres of forested land compared with MNF 2.

In addition to MNF 3, 4, and 5, Atlantic conceptually evaluated the possibility of a southern alternative corridor that would start at or near MP 44.6 on the proposed route and initially would follow the same alignment as MNF 5 to the Snowshoe Ski area near Thorny Flat. Rather than continuing to the east/northeast and rejoining the proposed route near the northern boundaries of the GWNF as MNF 3, 4, and 5 do, Atlantic evaluated a conceptual route extending in a southeast direction, crossing the GWNF, Blue Ridge Parkway, and Appalachian Trail near Montebello, Virginia, and rejoining the proposed route in the vicinity of Norwood, Virginia (see the route labeled “Conceptual Southern Route Alternative” on Figure 10.8.1-2).

From an operations perspective, as long as the conceptual alternative route could rejoin the proposed route upstream of Compressor Station 2, it would be compatible with Atlantic’s proposed operations and natural gas deliveries. If possible to find a corridor preferable to MNF 3, 4 and 5 from an environmental and constructability perspective, it would avoid backtracking sharply to the east to connect back to the proposed route north of Staunton, Virginia and could also reduce the overall length of the MNF alternative routes.

While many of the same constructability and construction access issues posed by MNF 3, 4, and 5 would also apply to the Conceptual Southern Route Alternative, environmental routing constraints associated with crossing the GWNF and JNF south of the proposed route appear to be insurmountable. These routing constraints include large sections of special management areas such as designated Wilderness Areas, potential wilderness areas, designated roadless areas, remote backcountry areas, and designated scenic areas. Atlantic’s assessment of potential route corridors in the general vicinity of the Conceptual Southern Route Alternative as shown on Figure 10.8.1-2 determined that there is not a feasible route across the GWNF and Blue Ridge Mountains in this area.

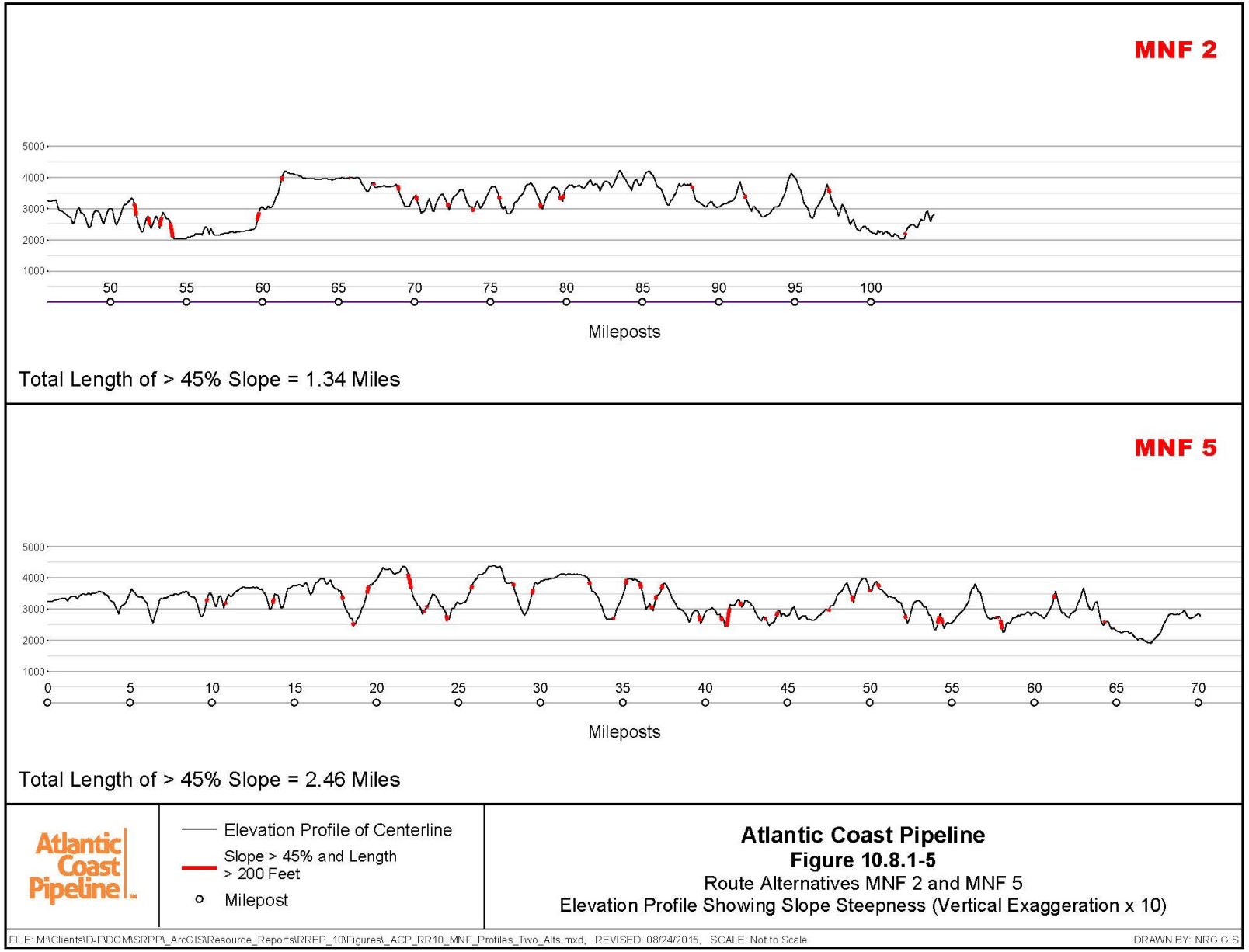
MNF 2
5000
4000
3000
2000
1000
50
55
60
65
70
75
80
85
90
95
100
Mileposts
Total Length of > 45% Slope = 1.34 Miles
MNF 5
5000
4000
3000
2000
1000
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Mileposts
Total Length of > 45% Slope = 2.46 Miles
Atlantic Coast Pipeline
Elevation Profile of Centerline
Slope > 45% and Length > 200 Feet
Milepost
Atlantic Coast Pipeline
Figure 10.8.1-5
Route Alternatives MNF 2 and MNF 5
Elevation Profile Showing Slope Steepness (Vertical Exaggeration x 10)
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TABLE 10.8.1-3

Constructability Issues Along the Monongahela National Forest (MNF) 5 Alternative Route

Site Number	Milepost Location [a]	Land Ownership	Landscape Feature	Issue/Comment [b]
1	12.0	Private	Beech Mountain	Steep slope requiring a graded equipment winch site on ridge top and a new access road along the ridge top
2	12.6	Private	Round Knob Mountain	Steep slope on west slope of Round Knob requiring a graded equipment winch site on ridge top and a new access road along the ridge top
3	12.8	Private	Round Knob Mountain	Steep slope on east side of Round Knob; would utilize same graded equipment winch site and access road as on the west side of the ridge
4	13.3	Private	Unnamed Ridge Top	Steep slope requiring a graded equipment winch site on ridge top and a new access road along the ridge top
5	13.4	Private	Unnamed Ridge Top, Long Run	Steep slope on an unnamed ridge above the west side of Long Run Stream requiring a graded equipment winch site on ridge top and a new access road along the ridge top
6	13.8	Private	Unnamed Ridge Top, Long Run	Steep slope on an unnamed ridge above the east side of Long Run Stream requiring a graded equipment winch site on ridge top and a new access road along the ridge top
7	16.1	Private	Unnamed Ridge Top, Back Fork Elk River	Steep slope on an unnamed ridge above the west side of Back Fork Elk River requiring a graded equipment winch site on ridge top and a new access road along the ridge top; little space for construction access at the stream crossing
8	16.7	Private	Unnamed Ridge Top, Back Fork Elk River	Steep slope on unnamed ridge above the east side of Back Fork Elk River requiring a graded equipment winch site on ridge top and a new access road along the ridge top; little space for construction access at the stream crossing
9	16.9	Private	Unnamed Ridge Top, Coalbank Fork	Steep slope on an unnamed ridge above the west side of Coalbank Fork requiring a graded equipment winch site on ridge top and a new access road along the ridge top
10	17.5	Private	Unnamed Ridge Top, Coalbank Fork	Steep slope on an unnamed ridge above the east side of Coalbank Fork requiring a graded equipment winch site on ridge top and a new access road along the ridge top
11	21.5	Private	Valley Fork, Elk River Fish Hatchery	Steep slopes on both sides of the Valley Creek and Route 49 approach to the waterbody and road; no room for equipment to build the waterbody and road crossing due to adjacent slopes
12	21.5 to 27.2	Private	Elk Mountain, Mingo Knob Area	Limited access with steep and rocky terrain
13	22.4	Private	Elk Mountain	Steep slope on the western approach requiring a graded equipment winch site on ridge top and a new access road along the ridge top
14	24.7	Private	Mingo Mountain	Steep slope on the east side requiring a graded equipment winch site on ridge top and new access road along the ridge top
15	27.3	State of West Virginia	Douglas Fork to Elk River	Difficult stream crossing with no landing spaces or work area at the bottom of the slopes adjacent to both sides of the stream and road; high potential for runoff issues
16	27.4	Private	Douglas Fork to Elk River (East Side)	Steep slope above the east side of Douglas Fork requiring a graded equipment winch site on ridge top and new access road along the ridge top
17	30.6	Private	East Slope of Middle Mountain	Steep slope on the east side of Middle Mountain requiring a graded equipment winch site on ridge top and new access road along the ridge top
18	31.2	Private	East Slope of Eastern Peak of Middle Mountain	Steep slope of the east side of the Eastern Peak of Middle Mountain requiring a graded equipment winch site on ridge top and a new access road along the ridge top
19	31.9	Private	Big Spring Fork	Difficult road/stream crossing combination with little room between the bottom of slope and road/stream; roadside park at road crossing location
20	32.5	MNF	Slaty Ridge	Steep slope on the north side of Buzzard Ridge Mountain requiring a graded equipment winch site on ridge top and a new access road along the ridge top
20	35.7 to 42.2	Private	Unnamed Ridge Tops; Elk Lick and Woods Run	This area would require 12 winch sites; each site has limited construction access; the sites would likely require new ridge top access roads

TABLE 10.8.1-3 (cont'd)

Constructability Issues Along the Monongahela National Forest – 5 Alternative Route

Site Number	Milepost Location	Land Ownership	Landscape Feature	Issue/Comment [a]
21	42.4 to 42.7	Private	Moses Spring Run	Steep slope on the west and east sides of Moses Spring Run; the crossing is about 0.4 mile upstream of Greenbrier River; each slope would require a graded equipment winch site on the ridge top; the stream crossing has steep slopes abutting the waterbody with little room for construction; the crossing is adjacent to Seneca State Forest
22	43.8 to 43.9	Private	Unnamed Tributary to Greenbrier River; Greenbrier River	Steep slopes on the west and east sides of a tributary to Greenbrier River and steep slope on the west side of Greenbrier River, each requiring a graded equipment winch site on the ridge top and new access roads along ridge tops; Greenbrier hiking trail at the bottom of the slope
23	44.0 to 44.4	MNF	Greenbrier River, Peters Mountain	Long, steep slope on the east side of Greenbrier River (west side of Peters Mountain) that would require grading of a winch site on top of the hill; the steep slope leads directly into the river, with minimal room for construction of the river crossing
24	45.7	MNF/Private	Peters Mountain	Steep slope descending off the east side of Peters Mountain requiring grading of an equipment winch site and access road along the ridge top
25	47.2 and 47.4	Private	Lower Mountain	Steep slope descending off the west and east side of Lower Mountain requiring the grading of new equipment winch sites and access roads along the mountain ridge top
26	48.2	Private	Charley Ridge	30 – 45 percent slope descending off the east side of Charley Ridge requiring the clearing and grading of a new equipment winch site and access road along the ridge top
27	51.5 to 51.8	Private	Stoney Run	Steep slopes in excess of 45 percent off the east side of an unnamed mountain down to Stoney Run; limited access to Stoney Run and limited landing areas on either side of the waterbody
28	51.8 to 52.0	Private/GWNF	Chestnut Ridge	Steep slopes in excess of 45 percent off the west side of Chestnut Ridge down to Stoney Run; limited access o Stoney Run and limited landing areas on either side of the waterbody
29	52.0 to 56.7	GWNF	Big Ridge, Erwin Draft , Gregory Ridge, Back Creek	Eight steep, extended length slopes, all of which would require the grading of winch sites for construction equipment
30	56.9 to 57.3	Private	Little Mountain, on the south side of Mill Gap	Two steep slopes on the west and east sides of Little Mountain requiring a single winching platform site to be cleared and graded; no construction access is available
31	58.8 to 59.9	Private	Back Creek Mountain	A series of long, steep slopes traversing the west and east sides of Back Creek Mountain requiring at least two winching platforms on the ridge top; access to the ridge top does not currently exist
32	60.8 to 60.9	Private	Unnamed Mountain west of Jackson River	Steep slope down to the river valley floor requiring a graded winching platform on the top of the mountain; an access road would need to be cleared to this location
33	61.1 to 61.2	Private	Dixon Hills east of Jackson River	Steep slope down to the river valley floor requiring a graded winching platform on top of the mountain; an access road would need to be cleared to this location
34	61.0	Private	Jackson River	No existing equipment access to the east side of the Jackson River
35	63.8 to 64.6	Private	Western Leg of Jack Mountain	Steep slopes on both the east and west sides of the west ridge of Jack Mountain; the ascent on both sides of the mountain would require the grading of a single construction equipment winching area; no construction access is available on top of this ridge line
36	65.3 to 67.5	Highland Wildlife Management Area	Jack Mountain, south Buck Hill	Steep slopes requiring at least three winching platforms and construction of new access roads
37	72.0 to 72.2	Private	Sheep Knob	Steep slope on the northeast side of Sheep Knob requiring a winching platform and an access road on the ridge top of Sheep Knob

[a] Mileposts along the MNF 5 route are based upon the two-dimensional length of the route. The length and mileposts assigned do not incorporate elevation changes.

[b] Steep slope refers to slopes in excess of 45 percent that would require excessive winching of construction equipment (e.g., trenching, pipe laying, lowering-in, and grading equipment) up and down the slope during pipeline construction activities.

Soil Database Analysis

In addition to the analyses described above, Atlantic compared the baseline and alternative routes using the Soil Survey Geographic (SSURGO) database from the USDA Natural Resources Conservation Service (NRCS). This comparison quantified crossings of prime farmland soils, compaction-prone soils, hydric soils, highly erodible soils, soils with revegetation concerns, stony/rocky soils, and soils with shallow bedrock. The results of the analysis are provided in Table 10.8.1-4.

TABLE 10.8.1-4

SSURGO Soil Data for the Monongahela National Forest Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	MNF 1	MNF 2	MNF 3	MNF 4	MNF 5
Prime Farmland [a]	miles	4.9	5.6	5.6	11.7	16.2	12.4
Compaction-prone land [b]	miles	0.9	0.8	0.7	0.8	0.7	0.4
Hydric soils crossed	miles	1.3	0.5	0.5	0.7	0.5	0.3
Highly erodible by water [c]	miles	51.8	48.5	47.1	68.4	58.7	67.1
Highly erodible by wind [d]	miles	0.1	1.0	0.0	0.0	0.0	0.3
Revegetation concerns [e]	miles	51.8	49.2	47.9	68.3	58.7	67.1
Stony soils crossed [f]	miles	52.8	49.7	48.6	69.2	61.4	63.8
Hard shallow bedrock crossed [g]	miles	36.6	31.1	29.0	38.2	38.7	34.9
Soft shallow bedrock crossed [g]	miles	4.8	6.2	6.3	20.9	13.8	21.7

[a] As designated by the Natural Resources Conservation Service.

[b] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[c] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[d] Includes soils with Wind Erodibility Group classification of one or two.

[e] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[f] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[g] Includes soils that have bedrock within 60 inches of the soil surface. Hard bedrock refers to lithic bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

[h] Includes soils that have bedrock within 60 inches of the soil surface. Soft bedrock refers to paralithic bedrock that will not likely require blasting during construction.

As shown in Table 10.8.1-4, MNF 1 and 2 cross 0.7 and 1.2 more miles, respectively, of prime farmland soils than the baseline; however, MNF 3, 4, and 5 cross between 7.0 and 11.5 more miles of prime farmland soils relative to the baseline. The southern routes (MNF 3, 4, and 5) additionally increase crossings of highly erodible soils, soils with revegetation concerns, and areas with hard shallow bedrock (i.e., less than five feet of topsoil cover) when compared with the baseline, MNF 1, and MNF 2. In areas of hard shallow bedrock, blasting or other special construction techniques could be required for installation of the proposed pipeline. MNF 2 has the shortest crossing lengths of highly erodible soils, soils with revegetation concerns, stony soils, and hard shallow bedrock areas. MNF 5 has the longest crossing lengths of these types of soils, but the shortest crossing lengths of compaction-prone and hydric soils.

MNF Route Selection

Atlantic's review of potential alternative routes north and east of the baseline across the MNF indicates that for reasons of steep, rugged topography and existing sensitive management

areas (e.g., the Laurel Fork North Wilderness Area and the Spruce Knob-Seneca Rocks NRA), it is not possible to collocate the AP-1 mainline with the existing Columbia pipeline infrastructure heading north and east of the proposed ACP route. Moreover, a route to the north and east of the proposed route would eventually have to go south to reconnect to the proposed pipeline, and in doing so, would cross the SNP.

As noted above, there currently is no general authority available to the NPS to approve rights-of-way for natural gas pipelines across park land (with the exception of the Blue Ridge Parkway). Instead, park-specific legislation enacted by the Congress and signed into law by the President is required to authorize the NPS to consider, review, analyze, and approve the construction of a natural gas pipeline crossing of NPS-managed lands. Based on recent Congressional action of the time required to secure the passage of legislation authorizing the NPS to consider individual natural gas pipeline crossings, there is no evidence to suggest that legislation could be enacted and the NPS analysis completed to issue a right-of-way grant to meet the Projects' purpose and need. The Projects' in-service date of November 2018 would not be met and the delivery of natural gas for power generation, which is the intended use for approximately 79 percent of the gas delivered by Atlantic, would not occur within the timeframe required to contribute to Virginia's and North Carolina's Clean Power Plan compliance obligations. Consequently, alternate greenfield routes would need to be identified to avoid these features. For all these reasons, Atlantic determined that potential alternatives to the north and east are not feasible.

Atlantic evaluated five major alternative routes south of the baseline route: two alternatives (MNF 1 and MNF 2) which optimize the baseline, and three alternatives (MNF 3, MNF 4, and MNF 5) which trend farther to the south. MNF 1 and MNF 2 range from 0.7 mile shorter to 0.4 mile longer than the baseline, while MNF 3, 4, and 5 add between 11.2 and 17.9 miles to the AP-1 mainline relative to the baseline. Of the five alternative routes, Atlantic believes that, based on desktop studies, detailed slope evaluations, and aerial reconnaissance to date, construction along MNF 2 appears to result in the least environmental impact by following existing cleared corridors through potential habitat for protected species, or by avoiding these habitat areas entirely. Construction of this route along previously disturbed and in some cases previously graded areas would avoid the most rugged terrain of all the alternatives, have the best existing access through the area (primarily via U.S. Highway 250) and, due to its comparably shorter length, would appear to result in the least impact to previously undisturbed lands.

As noted above, field surveys have been conducted to assess sensitive habitats along MNF 2. Atlantic has and continues to provide survey reports to the FERC and USFS as surveys and reports are completed.

10.8.1.3 George Washington National Forest Major Route Alternatives

The GWNF encompasses over a million acres of Federal land in West Virginia and Virginia (USFS, 2014c). It contains portions of the Appalachian Trail as well as six federally designated Wilderness Areas and a number of backcountry recreation areas, special biological areas, and visually sensitive areas. The GWNF contains the headwaters of the Potomac and James River watersheds, and is the largest Federal land holding within the entire Chesapeake Bay watershed. Portions of the GWNF are managed for timber production and wood products.

Given the northwest-to-southeast orientation of the proposed AP-1 mainline between central West Virginia and southern Virginia, it is not feasible to avoid crossing the GWNF altogether. However, Atlantic and DTI identified and evaluated several route alternatives based on review of the GWNF LRMP (USFS, 2014a) and input from USFS staff in an effort to minimize the crossing length and avoid sensitive areas within the forest. In addition to the baseline, Atlantic identified three alternative routes (GWNF 1, GWNF 2, and GWNF 3) between approximate MPs 106.5 and 173.0 in Highland, Augusta, and Nelson Counties, Virginia. The baseline route and each alternative are depicted on Figure 10.8.1-6, and comparative information on each route is provided in Table 10.8.1-5. The routes are discussed in detail in the subsections below.

The GWNFLRMP identifies a designated utility corridor that is roughly parallel to and between approximately 0.1 and 1.0 mile to the south of the proposed AP-1 mainline route on the GWNF. This corridor contains an existing DVP 500 kV electric transmission line. Atlantic evaluated the designated utility corridor as a potential route, but determined the terrain unsuitable for pipeline construction. The utility corridor traverses numerous steep side slopes and spans steep ravines which could not be crossed by a pipeline. Consequently, the designated utility corridor was rejected as a viable alternative route for the ACP.

As discussed in Section 10.8.1.2, Atlantic evaluated the possibility of a southern alternative corridor (i.e., the "Conceptual Southern Route Alternative" depicted on Figure 10.8.1-2) in an effort to avoid or minimize crossings of sensitive areas in the MNF. As described above, the conceptual route alternative initially follows the same alignment as MNF 5 to Thorny Flat, then heads southeast, crossing the GWNF, Blue Ridge Parkway, and Appalachian Trail near Montebello, Virginia, and rejoining the proposed route in the vicinity of Norwood, Virginia. In addition to constructability issues along the route due to terrain, environmental and land use constraints associated with crossing the GWNF south of the proposed route appear to be insurmountable. The Conceptual Southern Route Alternative would require crossing large sections of special management areas in the GWNF, such as designated Wilderness Areas, potential wilderness areas, designated roadless areas, remote backcountry areas, and/or designated scenic areas. Atlantic's assessment of potential route corridors in the general vicinity of the Conceptual Southern Route Alternative as shown on Figure 10.8.1-2 determined that there is not a feasible route across the GWNF or Blue Ridge Parkway in this area.

GWNF – Baseline

At 57.8 miles in length, the baseline route is the shortest of the four alternatives. Beginning at MP 106.5, the baseline initially heads southeast for approximately 33.0 miles, passing between Deerfield and West Augusta and east of Staunton, Stuarts Draft, and Waynesboro. At a point east of Greenville, the route turns south for approximately 15.0 miles, passing east of Montebello and north of Nash. It crosses the Blue Ridge Parkway approximately 7.0 miles south of Greenville, and the Appalachian Trail approximately 6.0 miles east of Montebello. At a point near Tyro, the route heads southeast for approximately 11.0 miles, terminating east of Lovingston.

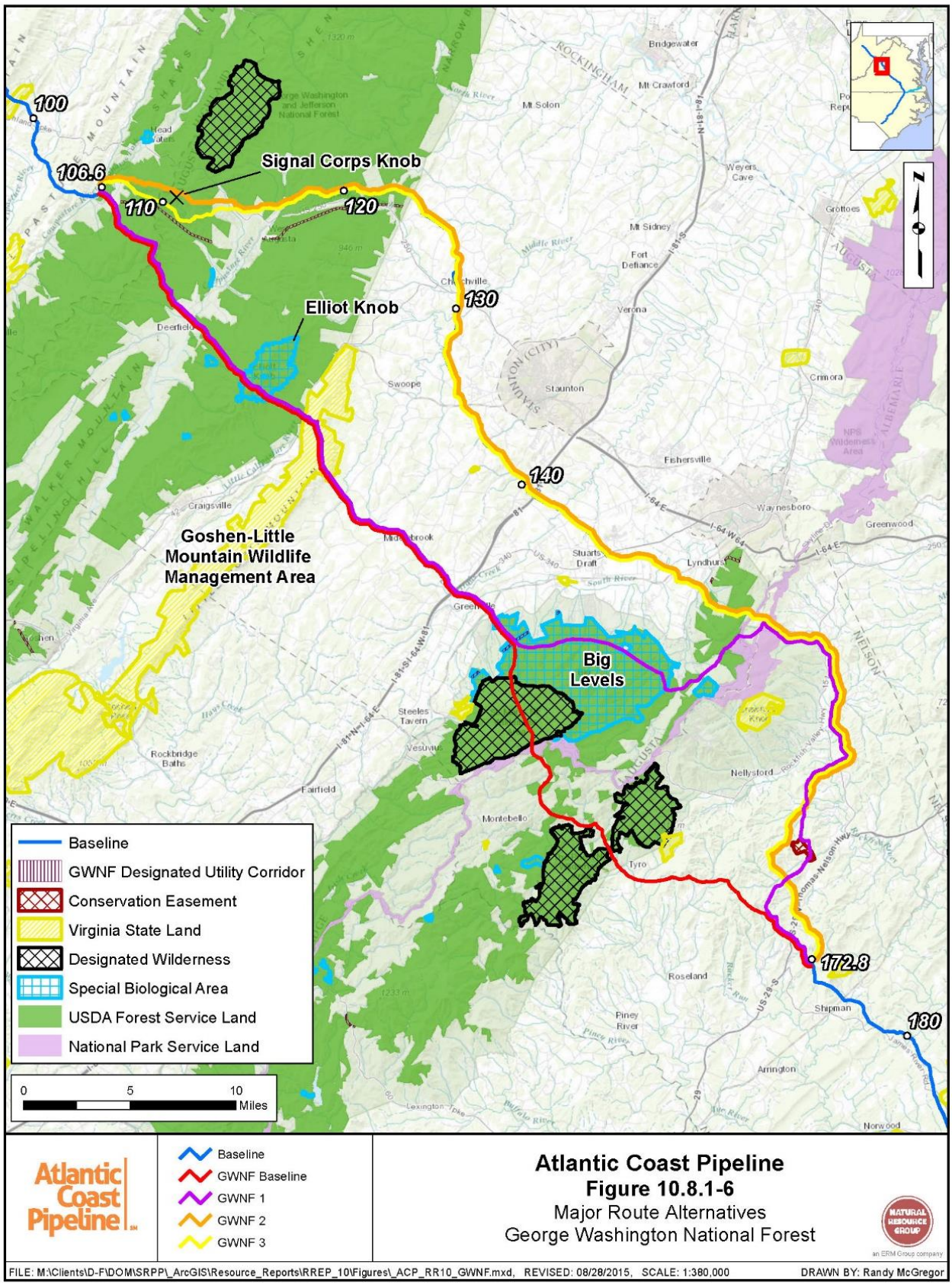

100
106.6
110
120
130
140
172.8
180
Signal Corps Knob
Elliot Knob
Goshen-Little Mountain Wildlife Management Area
Big Levels
Baseline
GWNF Designated Utility Corridor
Conservation Easement
Virginia State Land
Designated Wilderness
Special Biological Area
USDA Forest Service Land
National Park Service Land
0 5 10 Miles
Baseline
GWNF Baseline
GWNF 1
GWNF 2
GWNF 3
Atlantic Coast Pipeline
Figure 10.8.1-6
Major Route Alternatives
George Washington National Forest
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_GWNF.mxd, REVISED: 08/28/2015, SCALE: 1:380,000
DRAWN BY: Randy McGregor

TABLE 10.8.1-5

George Washington National Forest Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route [a]	GWNF 1 Route Alternative	GWNF 2 Route Alternative	GWNF 3 Route Alternative (proposed)
Length	miles	57.8	68.4	68.7	69.1
Primary U.S. or Commonwealth highway crossed	number	9	10	14	14
Other Commonwealth or local roads crossed	number	54	64	75	79
Adjacent to existing linear corridor facilities	miles	0.0	0.0	0.0	0.0
Federal lands crossed (total)	miles	24.5	26.7	12.8	13.0
National Park Service (total)	miles	0.6	0.7	0.5	0.5
Blue Ridge Parkway	miles	0.6	0.2	0.2	0.2
Appalachian Trail corridor	miles	0.0	0.5	0.3	0.3
U.S. Forest Service (total)	miles	23.9	26.0	12.3	12.5
Commonwealth lands crossed	miles	3.5	3.5	0.0	0.0
Private lands crossed	miles	29.8	38.2	55.9	56.1
Conservation easements crossed	miles	2.5	2.6	0.0	0.0
U.S. Forest Service management prescription units crossed (total)	miles	23.9	26.0	12.3	12.5
Blue Ridge Parkway corridor	miles	0.1	0.1	0.0	0.0
Designated wilderness	miles	3.5	0.0	0.0	0.0
Dispersed recreation	miles	0.0	1.2	0.0	0.0
Eligible recreation river corridor	miles	0.2	0.0	0.0	0.0
Mosaics of wildlife habitat	miles	10.3	10.7	12.3	12.5
Pastoral landscapes and rangelands	miles	0.0	0.5	0.0	0.0
Remote backcountry	miles	3.0	2.5	0.0	0.0
Scenic corridor and viewshed	miles	1.6	0.3	0.0	0.0
Special biological area	miles	5.2	10.7	0.0	0.0
Utility corridor	miles	0.1	0.1	0.0	0.0
U.S. Forest Service roadless areas	miles	2.5	3.5	0.0	0.0
U.S. Geological Survey karst topography crossing	miles	13.1	20.2	26.3	26.3
Karst features crossed (sinkholes and cave entrances)	number	1	1	17	17
Forested lands crossed	miles	46.8	54.3	41.6	42.1
Wetlands crossed – freshwater emergent	miles	<0.1	<0.1	0.1	0.1
Wetlands crossed – freshwater forested/shrub	miles	<0.1	0.3	0.4	0.4
Intermittent waterbodies crossed	number	23	52	68	69
Perennial waterbodies crossed	number	24	41	39	38
McDowell Battlefield study area crossed	miles	0.0	0.0	0.6	0.3
George Washington National Forest scenic integrity areas crossed (very high or high ranking)	miles	9.9	11.4	1.2	0.3
George Washington National Forest roadless areas crossed	miles	2.5	3.5	0.0	0.0
George Washington National Forest potential wilderness areas crossed	miles	5.8	7.9	0.0	0.0
Roads crossed within the George Washington National Forest	number	36	39	30	32
Trails crossed within the George Washington National Forest	number	13	11	4	4
VDOF Forest Conservation Model high ranking areas crossed	miles	35.0	33.9	26.5	26.8

TABLE 10.8.1-5 (continued)

George Washington National Forest Major Route Alternatives for the Atlantic Coast Pipeline

The Nature Conservancy critical habitat					
Forest core priority interior habitat	miles	13.2	16.6	11.1	11.1
Natural cover within active river areas	miles	0.3	0.0	0.0	0.0
Natural communities within resilient areas	miles	2.8	6.6	0.0	0.0
National Rivers Inventory listed rivers	number	3	0	0	0
VDCR scenic rivers – designated scenic rivers crossed	number	1	0	0	0
VDCR scenic rivers – qualified or potential scenic rivers crossed	number	1	1	1	1
FWS IPAC unofficial threatened and endangered species listed within 300 feet of the project segment	number	9	9	10	10
Slope of lands crossed					
0-20 percent	miles	30.2	44.7	45.6	45.5
20-35 percent	miles	15.7	15.9	15.1	15.6
35-50 percent	miles	8.7	6.0	6.3	6.3
50-65 percent	miles	2.3	1.3	1.4	1.4
Greater than 65 percent	miles	0.9	0.4	0.2	0.3

[a] The length of the baseline incorrectly was reported as 58.8 miles in Resource Report 10 due to typo; the correct length is 57.8. The length of private land crossed for the baseline was adjusted to reflect this change.

The baseline route crosses approximately 23.9 miles of the GWNF, including 3.0 miles in the St. Mary's Wilderness Area and 0.5 mile in the Three Ridges Wilderness Area. As noted above, crossings of Wilderness Areas require an authorization from the President or Congress. If such an authorization could be obtained at all, it would be infeasible to obtain it within the timeframe required by the purpose and need of the Projects. The baseline route additionally crosses management prescription units in the forest designated as special biological areas, scenic corridors and viewsheds, and remote backcountry as well as designated roadless areas and potential wilderness areas. Atlantic understands that utility corridors generally are prohibited in these areas.

Outside the GWNF, the baseline route crosses 0.6 mile of NPS lands, including the Blue Ridge Parkway and Appalachian Trail; approximately 3.5 miles of Commonwealth lands in the Goshen-Little Mountain Wildlife Management Area (WMA); and approximately 2.5 miles of private lands subject to conservation easements held by the Virginia Outdoors Foundation (VOF). The baseline route crosses the fewest amount of wetlands and waterbodies, but the second most miles of forested land. The baseline also crosses 35.0 miles of high ranking forest areas identified in a VDOF forest conservation model, which is more than any of the alternative routes.

At 13.1 miles, the baseline crosses the least amount of lands identified by the USGS as potentially containing karst, and has the fewest number of known karst features (1) within 100 feet of the centerline as identified by the Virginia Department of Conservation and Recreation (VDCR).

GWNF 1

GWNF 1 is approximately 68.4 miles long, which is 10.6 miles longer than the baseline. It follows the same alignment as the baseline for approximately 32.0 miles, then heads east-northeast for approximately 17.0 miles to avoid crossing the St. Mary's and Three Ridges Wilderness Areas. The route crosses the Blue Ridge Parkway and Appalachian Trail approximately 3.0 miles south of I-64 at Afton Mountain. In Rockfish Valley, the route turns south and continues for approximately 32.0 miles, where it intersects the baseline near Woods Mountain in Nelson County. It then follows the same alignment as the baseline to the terminus approximately at MP 173.0, east of Lovingston.

GWNF 1 crosses approximately 26.0 miles of GWNF lands, including areas designated as remote backcountry, scenic corridors and viewsheds, special biological areas, and roadless areas. One of the special biological areas, Elliott Knob, provides habitat for several sensitive species, including the Cow Knob salamander, which is protected by special management standards set out in the GWNF LRMP. Another special biological area, Big Levels, contains unique groundwater features, vernal pools, dense concentrations of prehistoric archaeological sites, as well as habitat for several sensitive species. Staff from the GWNF recommended avoiding these areas. In addition, GWNF 1 crosses 7.9 miles of potential wilderness area, which is 2.1 more miles than the baseline route and 7.9 more miles than GWNF 2 and GWNF 3.

Outside the national forest, GWNF 1 crosses approximately 0.7 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail; 3.5 miles of Commonwealth land in the Goshen-Little Mountain WMA; and 2.6 miles of private land subject to conservation easements held by the VOF and VDOF. It crosses more wetlands and waterbodies than the baseline route, but less than the other alternatives. GWNF 1 additionally crosses 1.1 fewer miles of high ranking forest areas identified in a VDOF forest conservation model than the baseline. The route crosses the most forested land, but the second fewest land identified by the USGS as potentially containing karst topography, and it has the fewest number of karst features (1) within 100 feet of the centerline.

GWNF 2

GWNF 2 is approximately 68.7 miles long, which is 10.9 miles longer than the baseline. Starting at MP 106.5, the route initially heads east for approximately 16.0 miles, passing north of West Augusta. It then heads south-southeast for approximately 34.0 miles, passing north of Stuarts Draft and south of Staunton and Waynesboro. Like GWNF 1, it crosses the Blue Ridge Parkway approximately 3.0 miles south of I-64 at Afton Mountain. After crossing Rockfish Valley Road, the route heads south for another 19 miles, passing east of Wellsford and Lovingston, and terminating at MP 173.0.

GWNF 2 crosses approximately 12.3 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Based on discussions with USFS staff, lands within this management prescription unit would be considered suitable for a utility crossing of the national forest. Relative to GWNF 1, the route avoids the Elliott Knob and Big Level special biological areas and designated roadless areas, but crosses approximately 0.6 mile of the study area for the McDowell Battlefield site. It additionally crosses Signal Corps Knob, which USFS

staff identified as an important site used as a signal station by both the Union and Confederate Armies during the Civil War. Unlike the baseline and GWNF 1, GWNF 2 does not cross any potential wilderness area within the GWNF.

Outside the national forest, GWNF 2 crosses approximately 0.5 mile of NPS land at the Blue Ridge Parkway and Appalachian Trail, but avoids the Goshen-Little Mountain WMA as well as crossings of conservation easements. It crosses the same amount of wetlands and waterbodies as GWNF 3, but crosses more waterbodies than the baseline and GWNF 1 route alternatives. It crosses the least amount of forested land and fewest miles of high ranking forest areas identified in a VDOF forest conservation model, but the most amount of land identified by the USGS as potentially containing karst topography. It also has the most sinkhole and cave entrances within 100 feet of the centerline, as identified by the VDCR. Potential karst impacts are the same of GWNF 3.

GWNF 3

GWNF 3 has a total length of 69.1 miles, which is 11.3 miles longer than the baseline route. It follows the same alignment as GWNF 2, with the exception of a short segment between MPs 107.7 and 114.2, where it passes approximately one mile to the south in the vicinity of Signal Corps Knob. GWNF 3 crosses 12.5 miles of USFS lands, all within the mosaic of wildlife habitat management prescription unit. Like GWNF 2, the route avoids the Elliot Knob and Big Level special biological areas, designated roadless areas, and potential wilderness areas. It also avoids the Civil War site on Signal Corp Knob and crosses 0.3 mile less of the McDowell Battlefield site.

As originally conceived, GWNF 3 crossed the Blue Ridge Parkway and Appalachian Trail on 0.5 mile of NPS lands. As explained in Section 10.8.1.5, however, Atlantic subsequently modified the route to cross the Appalachian Trail on lands owned and administered by the GWNF as part of the Appalachian Trail South Major Route Alternative. GWNF 3 avoids the Goshen-Little Mountain WMA and conservation easements and crosses the same amount of wetlands and waterbodies and as GWNF 2. The route crosses less forested land than the baseline and GWNF 1 and just 0.5 more mile of forested land and 0.3 more mile of high ranking forest areas identified in a VDOF forest conservation model than GWNF 2. GWNF 3 crosses the most lands identified by the USGS as potentially containing karst topography and it has the most sinkhole and cave entrances within 100 feet of the centerline, as identified by the VDCR. Potential karst impacts are the same as GWNF 2.

Soil Database Analysis

Atlantic conducted a desktop soil analysis of the GWNF routes using the USDA SSURGO database. Based upon the SSURGO database, the baseline crosses the least amount of prime farmland soils, compaction-prone soils, hydric soils, soils that are highly erodible by water, soils with revegetation concerns, and stony soils. This is due in part to the baseline route having the shortest overall length than the route alternatives. GWNF 2 and 3 avoid crossing soils that are highly erodible by wind, while the baseline and GWNF 1 cross 1.2 and 0.3 miles, respectively. The baseline and the three route alternatives all cross between 28.1 and 26.5 miles of soils with shallow bedrock (five feet of less of soil cover). GWNF 3 crosses the least amount

of soils with hard shallow bedrock where blasting or other special construction techniques could be required for installation of the proposed pipeline. Table 10.8.1-6 shows the complete SSURGO data for each of the route alternatives.

TABLE 10.8.1-6

SSURGO Soil Data for the George Washington National Forest Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Baseline Route	GWNF 1	GWNF 2	GWNF 3
Prime Farmland [a]	miles	14.5	18.0	27.9	28.0
Compaction-prone land [b]	miles	0.0	0.7	1.1	1.1
Hydric soils crossed	miles	0.2	0.4	0.8	0.8
Highly erodible by water [c]	miles	46.5	50.7	50.0	50.7
Highly erodible by wind [d]	miles	1.2	0.3	0.0	0.0
Revegetation concerns [e]	miles	47.1	51.3	51.6	52.2
Stony soils crossed [f]	miles	41.7	52.4	48.1	48.6
Hard shallow bedrock crossed [g]	miles	23.7	20.8	16.4	15.6
Soft shallow bedrock crossed [g]	miles	4.9	6.7	10.5	11.3

[a] As designated by the Natural Resources Conservation Service.

[b] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[c] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[d] Includes soils with Wind Erodibility Group classification of one or two.

[e] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[f] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[g] Includes soils that have bedrock within 60 inches of the soil surface. Hard bedrock refers to lithic bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

[h] Includes soils that have bedrock within 60 inches of the soil surface. Soft bedrock refers to paralithic bedrock that will not likely require blasting during construction.

GWNF Route Selection

Although it is the longest of the four alternatives, Atlantic identified GWNF 3 as the preferred alternative. This route minimizes impacts on sensitive resources in the GWNF, including areas with special management designations, designated roadless areas, and Civil War sites. It reduces the crossing of NPS lands at the Blue Ridge Parkway and Appalachian Trail, and avoids Commonwealth lands and conservation easements. It crosses more wetlands and waterbodies than the baseline and GWNF 1 alternatives, primarily due to the increased length of the route, and the same amount of these features as GWNF 2. It also crosses the second fewest miles of forested lands of the four routes. While GWNF 3 crosses the most miles of areas potentially containing karst, impacts on karst features will be avoided or mitigated through implementation of Atlantic's and DTI's *Karst Monitoring and Mitigation Plan* (see appendix 1F of Resource Report 1 and Resource Report 6). For all these reasons, Atlantic incorporated GWNF 3 into the proposed route.

Subsequent to selecting GWNF 3 as the preferred route, another alternative, the Appalachian Trail South Major Route Alternative, was identified and evaluated in this area. This alternative, which changed the location of the proposed crossing of the Appalachian Trail and Blue Ridge Parkway, was incorporated into the proposed route. The Appalachian Trail South Major Route Alternative is discussed in Section 10.8.1.5 below.

10.8.1.5 Appalachian Trail South Major Route Alternative

The Appalachian Trail began as an idea shared by a small group of hikers and outdoor enthusiasts in the early 20th Century. These enthusiasts envisioned an uninterrupted walking trail along the ridges of the Appalachian Mountains with camps and farms. The early days of the effort to connect a multi-state string of trails initially was met with advances and setbacks. However, those dedicated to a continuous trail organized into local groups, identified trail segments, pursued new segments to connect existing segments, and cleared paths for the trail. The work of the organizers and volunteers culminated in 1937 with an Appalachian Trail nearly 2,000 miles as first imagined from Maine to Georgia. At that time, and for many years after, the Appalachian Trail was a product of private citizens without support from the Federal government.

In 1968, with the enactment of the National Trails System Act, the Appalachian Trail was designated as a national scenic trail. Since that designation, the Federal government has provided annual appropriations to acquire lands for the trail and to promote its protection in serene settings. Various segments of the Appalachian Trail have been re-located from private lands onto public lands and away from commercial activities to maintain the integrity of the trail. Today, the Appalachian Trail runs for approximately 2,185 miles from Georgia to Maine.

The lands acquired for the Appalachian Trail are managed by the NPS with a Cooperative Agreement with the USFS, recognizing that the USFS is responsible for segments of the trail within National Forest boundaries. The NPS also entered into a formal relationship with the Appalachian Trail Conference, later renamed the Appalachian Trail Conservancy (ATC), conveying to the ATC responsibility for the management, maintenance, and protection of the trail and a safe and undisturbed outdoor experience between humans and nature.

Today, the Appalachian Trail is managed using the Appalachian National Scenic Trail Cooperative Management System, which includes the NPS, USFS, ATC, and various local and State/Commonwealth agencies, with the NPS as lead Federal agency. Additionally, in Virginia, the Appalachian Trail has benefitted from a strong Federal, Commonwealth, and private partnership governed by a Memorandum of Understanding (2010) for the trail in the Commonwealth of Virginia.

The baseline route for the ACP (a segment of GWNF 3 for purposes of this analysis) crosses the Appalachian Trail on NPS lands in Nelson County, Virginia, approximately 3.6 miles to the southwest of Afton Mountain. In various telephone calls and in a meeting on February 23, 2015, the NPS's Appalachian Trail Park Office reiterated to Atlantic that the NPS lacks general legal authority to approve rights-of-way for natural gas transmission pipelines across NPS lands (other than the Blue Ridge Parkway). Based on these conversations, Atlantic investigated potential routing options and alternative crossing locations within the same general area that would avoid crossing the trail on NPS lands.

North of the baseline crossing, the Appalachian Trail is wholly located on NPS lands to the point where it enters SNP. South of the baseline crossing, Atlantic identified a potential crossing of the trail on USFS lands in the GWNF approximately 7.4 miles to the southwest at a point near Reeds Gap in Augusta County, Virginia. Atlantic's engineers subsequently studied this potential crossing and approaches to and from the trail, and concluded that a route across the Appalachian Trail at this location is technically feasible and constructible. Atlantic then

identified an alternative route to the baseline (the Appalachian Trail South Major Route Alternative) using this alternate crossing of the trail. The baseline and alternative routes are depicted on Figure 10.8.1-8, and comparative information on the two routes is provided in Table 10.8.1-7.

The baseline route begins approximately at MP 149.4 east of Stuarts Draft. From this point, the baseline heads southeast for approximately 8.1 miles, crossing USFS lands in the GWNF, NPS lands along the Blue Ridge Parkway, [35] and NPS lands along the Appalachian Trail. After crossing Virginia Highway 151, the baseline route heads south for approximately 7.2 miles across Rockfish Valley and Pilot Mountain to a point just east of Virginia Highway 6. It then turns to the east/southeast and continues for 4.6 miles, crossing Rockfish River and McLean Mountain and passing east of Gullysville. The baseline route terminates at a point along Roberts Mountain.

The baseline route measures approximately 19.9 miles in length. It crosses 2.1 miles of Federal lands, including 1.8 miles of USFS lands in the GWNF, 0.1 mile of NPS lands at the Blue Ridge Parkway, and 0.2 mile of NPS lands at the Appalachian Trail. The route additionally crosses 0.1 mile of existing conservation easement and 1.3 miles of proposed easement. A majority of the route (14.2 miles) crosses forested lands. The baseline crosses 1.6 miles of lands identified by the USGS as potentially containing karst terrain, including four karst features within 100 feet of the pipeline centerline. The route also crosses 0.2 mile of wetland, 26 intermittent waterbodies, 14 perennial waterbodies, and 1.0 mile of source water protection areas.

Relative to the baseline, the Appalachian Trail South Major Route Alternative initially heads south from MP 149.4 for approximately 8.1 miles, running parallel to Mount Torrey Road. At a point just south of Torry Ridge, the route alternative then heads east for approximately 6.2 miles, crossing USFS lands in the GWNF, including the Appalachian Trail, NPS lands along the Blue Ridge Parkway, and an east trending ridge along Piney and Bryant Mountains. After crossing Rockfish Valley, the route heads southeast for 3.2 miles, crossing Horseshoe Mountain and terminating at a point along Roberts Mountain.

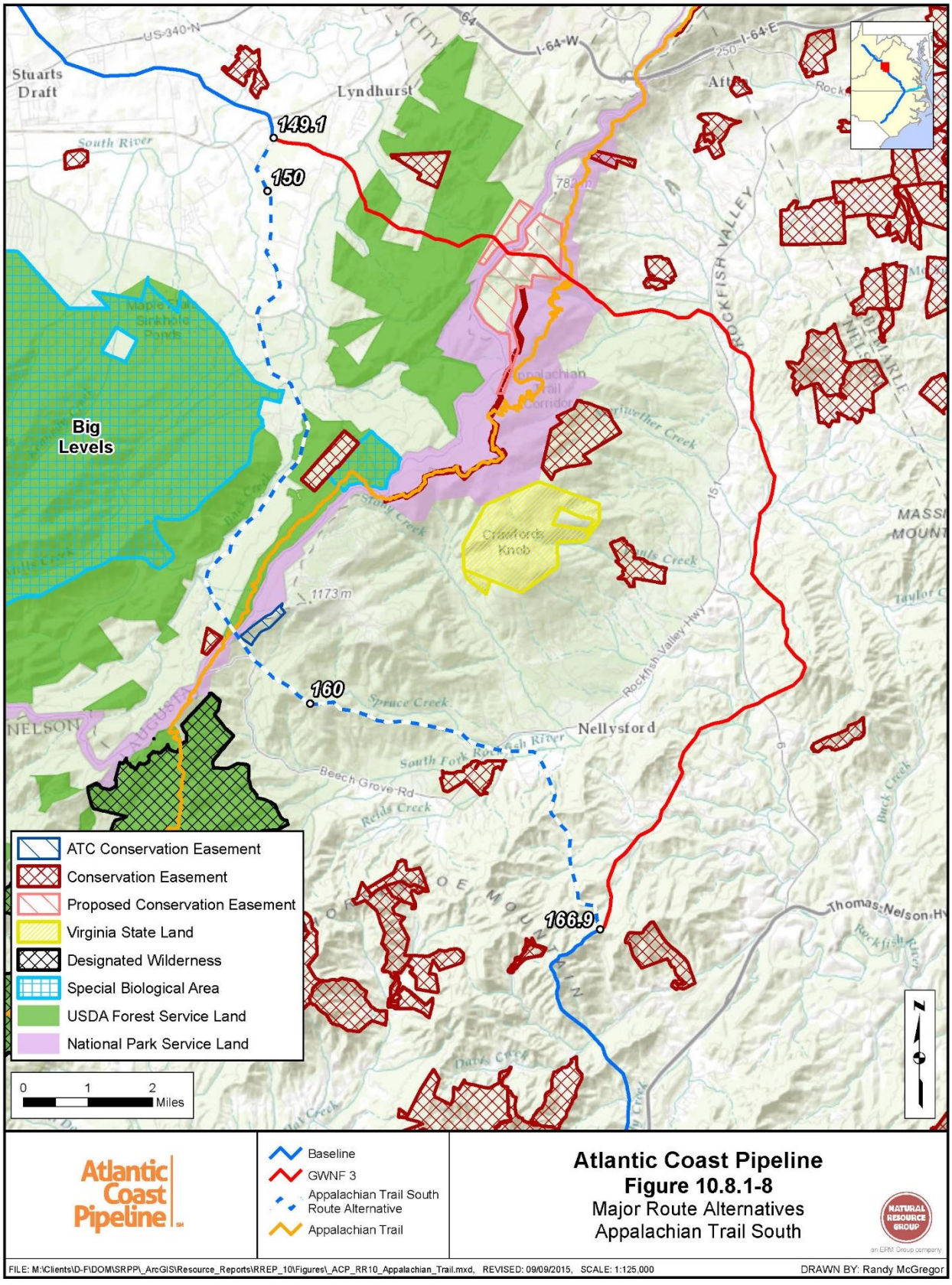
The alternative route measures approximately 17.5 miles in length. It crosses 1.1 miles of USFS lands in the GWNF (including the Appalachian Trail) and 0.1 mile of NPS lands along the Blue Ridge Parkway. The route avoids existing and proposed conservation easements. It crosses 14.1 miles of forested lands, 4.3 miles of karst topography, 9 karst features, 0.2 mile of wetlands, 23 intermittent waterbodies, 7 perennial waterbodies, and 1.5 miles of source water protection areas. Crossings of other features are similar to the baseline route.

[35] Unlike the Appalachian Trail and other NPS lands, the NPS has the authority to grant a right-of-way for a natural gas pipeline across the Blue Ridge Parkway under Public Law 74-848.

TABLE 10.8.1-7

Appalachian Trail South Major Route Alternative for the Atlantic Coast Pipeline

Features	Unit	Proposed Route (GWNF 3)	Appalachian Trail South Route Alternative
Length (total)	miles	19.9	17.5
Primary U.S. or Commonwealth highways crossed	number	3	3
Other Commonwealth or local roads crossed	number	19	21
Adjacent to existing linear corridor facilities	miles	0.0	0.0
Federal lands crossed (total)	miles	2.4	1.2
Appalachian Trail (NPS)	miles	0.5	0.0
Blue Ridge Parkway (NPS)	miles	0.1	0.1
George Washington National Forest (USFS)	miles	1.8	1.1
Commonwealth lands crossed	miles	0.0	0.0
U.S. Forest Service management prescription units crossed (total)	miles	1.8	1.1
Appalachian Trail corridor	miles	0.0	0.1
Dispersed recreation	miles	0.0	1.0
Mosaics of wildlife habitat	miles	1.8	0.0
Conservation easements crossed (VDOF)			
Existing easements	miles	0.1	0.0
Proposed easements	miles	1.3	0.0
Recreational trails crossed	number	3	6
U.S. Geological Survey karst topography crossing	miles	1.6	4.3
Karst features crossed (sinkholes and cave entrances)	number	4	9
Forested land crossed	miles	14.2	14.1
Wetlands crossed – forested/shrub	miles	0.2	0.2
Intermittent waterbodies crossed	number	26	23
Perennial waterbodies crossed	number	14	7
Battlefields crossed	miles	0.0	0.0
Source water protection areas crossed	miles	1.0	1.5
George Washington National Forest scenic integrity areas crossed (very high or high ranking)	miles	0.0	0.1
Roads crossed within the George Washington National Forest	number	5	8
Trails crossed within the George Washington National Forest	number	1	1
VDOF forest conservation model high ranking areas crossed	miles	8.4	9.7
The Nature Conservancy critical habitat			
Forest core priority interior habitat	miles	0.9	2.9
Natural cover within active river areas	miles	0.0	0.0
Natural communities within resilient areas	miles	0.0	0.0
National Rivers Inventory listed rivers crossed	number	0	0
VDCR scenic rivers – designated scenic rivers crossed	number	0	0
VDCR scenic rivers – qualified or potential scenic rivers crossed	number	0	0
FWS IPAC unofficial threatened and endangered species listed within 300 feet of the project segment	number	5	6
Slope of lands crossed			
0-20 percent	miles	11.9	11.9
20-35 percent	miles	5.7	3.3
35-50 percent	miles	1.9	1.8
50-65 percent	miles	0.4	0.5
Greater than 65 percent	miles	0.1	0.1


Stuarts Draft
Lyndhurst
US-340-N
I-64-W
I-64-E
149.1
150
160
166.9
South River
Big Levels
Spruce Creek
Nellysford
Beech Grove Rd
Reids Creek
Rockfish Valley Hwy
Thomas Nelson Hwy
ROCKFISH VALLEY
Crawford Knob
1173 m
ATC Conservation Easement
Conservation Easement
Proposed Conservation Easement
Virginia State Land
Designated Wilderness
Special Biological Area
USDA Forest Service Land
National Park Service Land
0 1 2 Miles
Baseline
GWNF 3
Appalachian Trail South Route Alternative
Appalachian Trail
Atlantic Coast Pipeline
Atlantic Coast Pipeline
Figure 10.8.1-8
Major Route Alternatives
Appalachian Trail South
NATURAL RESOURCE GROUP
an ERM Group company
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\Resource_Reports\RREP_10\Figures_ACP_RR10_Appalachian_Trail.mxd, REVISED: 09/09/2015, SCALE: 1:125,000
DRAWN BY: Randy McGregor

Soil Database Analysis

Atlantic utilized the USDA SSURGO database to compare the baseline and Appalachian Trail South Major Route Alternative. The alternative route reduces the crossing length of prime farmland soils by 1.0 mile, compaction-prone soils by 0.2 mile, highly erodible by water soils by 1.4 miles, soils with revegetation concerns by 0.8 mile, and soils with bedrock less than five feet below the surface by 4.2 miles, including 2.1 fewer miles of hard bedrock that would likely require blasting or other special construction techniques to facilitate pipeline construction. The baseline route crosses less hydric soils and stony soils than the alternative route. Table 10.8.1-8 shows the complete SSURGO soil analysis data for both routes.

TABLE 10.8.1-8

SSURGO Soil Data for the Appalachian Trail South Major Route Alternatives for the Atlantic Coast Pipeline

Features	Unit	Proposed Route (GWNF 3)	Appalachian Trail South Route Alternative
Prime Farmland [a]	miles	6.9	5.9
Compaction-prone land [b]	miles	0.7	0.5
Hydric soils crossed	miles	0.2	0.4
Highly erodible by water [c]	miles	12.0	10.6
Highly erodible by wind [d]	miles	0.0	0.0
Revegetation concerns [e]	miles	12.6	11.4
Stony soils crossed [f]	miles	12.8	13.5
Hard shallow bedrock crossed [g]	miles	4.5	2.5
Soft shallow bedrock crossed [g]	miles	2.7	0.6

[a] As designated by the Natural Resources Conservation Service.

[b] Includes soils that have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.

[c] Includes land in capability subclasses 4E through 8E and soils with an average slope greater than or equal to 9 percent.

[d] Includes soils with Wind Erodibility Group classification of one or two.

[e] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than or equal to 9 percent.

[f] Includes soils that have either: 1) a very gravelly, extremely gravelly, cobbley, stony, bouldery, flaggy, or channery modifier to the textural class, or 2) have greater than 5 percent (weight basis) of rock fragments larger than 3 inches in any layer within the profile.

[g] Includes soils that have bedrock within 60 inches of the soil surface. Hard bedrock refers to lithic bedrock that may require blasting or other special construction techniques during installation of the proposed pipeline segments.

[h] Includes soils that have bedrock within 60 inches of the soil surface. Soft bedrock refers to paralithic bedrock that will not likely require blasting during construction.

Appalachian Trail South Route Selection

Relative to the proposed route, the Appalachian Trail South Major Route Alternative is 2.4 miles shorter, avoids NPS lands along the Appalachian Trail, avoids existing and proposed conservation easements, and reduces the crossing length of the GWNF by 0.7 mile. Within the national forest, the route alternative crosses lands within the dispersed recreation/unsuitable timberland and Appalachian Trail corridor management prescription units, while the baseline crosses lands within the mosaics of wildlife habitat management prescription unit. The route alternative crosses seven fewer perennial waterbodies and three fewer intermittent waterbodies, though it crosses 0.5 mile more of source water protection area than the baseline. The route alternative also crosses fewer soils of concern, such as highly erodible soils and soils with revegetation concerns, and fewer miles of soils with near-surface hard bedrock where blasting or other special construction techniques could be required.

Both routes cross the Blue Ridge Parkway and Appalachian Trail along the spine of the Blue Ridge Mountains. Atlantic is evaluating the use of a single horizontal directional drill (HDD) to install the pipeline beneath the Appalachian Trail and Blue Ridge Parkway. Use of the HDD method would avoid direct impacts on the trail and parkway.

For all these reasons discussed above, the Appalachian Trail South Major Route Alternative was identified as the preferred alternative and incorporated into the proposed route.

Additional Justification for the Appalachian Trail South Major Route Alternative

In a letter to FERC dated July 30, 2015, the USFS requested additional discussion of the reasons USFS lands along the Appalachian Trail South Major Route Alternative were selected for the proposed crossing of the Appalachian Trail rather than NPS lands on the original baseline route. Atlantic recognizes that the NPS does not possess the administrative authority to consider or issue a right-of-way grant for a natural gas pipeline to cross the Appalachian Trail on NPS-administered lands. The NPS's authority to grant rights-of-way over most lands in the NPS system (which originate in 16 United States Code 5) allows the NPS to consider rights-of-way for electrical transmission and distribution lines, telephone lines, and water conduits, but not for natural gas pipelines. In various meetings and telephone calls with Atlantic, the NPS explained and reiterated these authorities. Further, the NPS advised Atlantic that it would not evaluate the appropriateness or consider a proposed crossing of the Appalachian Trail on NPS-administered lands given these authorities.

The proposed routing of the Appalachian Trail South Major Route Alternative through USFS lands in the GWNF, including the Appalachian Trail, and NPS lands along the Blue Ridge Parkway has been identified because the location meets multiple obligations of the Project. First, as described at the beginning of Section 10.8.1.5, the section of the Appalachian Trail on GWNF lands was identified as a preferred crossing of the trail because this location has fewer environmental impacts to Federal lands than the original proposed crossing of the Appalachian Trail on lands administered by the NPS. The preferred route is approximately 2.4 miles shorter in length than the initial route, including 1.2 fewer miles through Federal lands (0.7 mile less in the GWNF and 0.5 mile less in NPS-administered lands on the Appalachian Trail). The proposed route additionally crosses 10 fewer perennial and intermittent waterbodies than the initial route.

Another factor is that the proposed crossing of the Appalachian Trail on USFS lands in the GWNF (approximate MP 158.1 of the AP-1 mainline) will be accomplished by HDD, a trenchless method of installing underground pipelines with minimal impact to the surrounding environment. Installing the pipeline under the Appalachian Trail and Blue Ridge Parkway at this location using the HDD method will minimize visual impacts as it eliminates the need to remove trees and to maintain an open right-of-way on the Federal lands in the immediate vicinity of the trail and parkway. The HDD method also affords the added benefit of minimizing the number and length of access roads needed to install the pipeline. As such, the Appalachian Trail South Major Route Alternative has less environmental impact and will minimize disruptions to visitors of the Appalachian Trail and Blue Ridge Parkway.

In addition to the environmental benefits described above, the preferred route reflects and avoids nationally significant parcels within the GWNF as identified in the GWNF LRMP (USFS, 2014a) including federally designated and potential Wilderness Areas, Research Natural Areas, Special Biological Areas, roadless areas, backcountry recreation areas, scenic areas, and the unique hardwood forested area at Laurel Fork.

Atlantic also notes that the USFS has the administrative authority to allow for natural gas pipelines to cross National Forest lands (including the Appalachian Trail) in locations that do not conflict with the management objectives of the area. As described in its mission statement, the USFS was established "to sustain the health, diversity, and productivity of the nation's forests to meet the needs of present and future generations." The USFS carries out its mandate by ensuring that National Forests provide for the multiple use and sustained yield that maximize the long-term benefits in an environmentally sound manner.

The NPS, which can issue a right-of-way grant for a natural gas pipeline crossing of the Blue Ridge Parkway, does not have comparable administrative authority in the consideration and issuance of a right-of-way grant for natural gas pipelines across other lands managed by the NPS, such as SNP or the Appalachian Trail. The NPS is charged with preserving these lands of unparalleled natural, historic, and recreational values for the enjoyment of future generations. These lands of great natural beauty and storied history are to be protected by the NPS leaving them unimpaired for future generations. As the NPS has a purpose distinct from the USFS, the routing of the AP-1 mainline on USFS lands in a location determined to be suitable is consistent with the USFS's multiple use mission.

Atlantic recognizes that it must work collaboratively with the USFS and NPS to determine a compatible route for the underground pipeline in order for the agencies to provide right-of-way grants for the Project.

10.9 ROUTE VARIATIONS – EXCERPT FROM SUPPLEMENTAL FILING

The Cheat Mountain Route Variation and the Cow Knob HDD Route Variation, which were included in a supplemental filing to FERC on October 30, 2015 both affect lands owned by the USFS. Therefore, the analysis regarding these two route variations is being included in this document. The analysis has not been changed since the supplemental filing.

10.9.1 Cheat Mountain Route Variation

Atlantic identified and evaluated the Cheat Mountain Route Variation to avoid construction close to a residence, avoid side slope construction, and reduce potential impacts on Cheat Mountain salamander occupied habitat in the MNF in Randolph County, West Virginia. The proposed route and Cheat Mountain Route Variation are depicted on Figure 3.1-1 (provided in Appendix B of this filing as Privileged Information), and comparative data on each route is provided in Table 3.1-1.

TABLE 3.1-1

Cheat Mountain Route Variation for the Atlantic Coast Pipeline

Features	Unit	Proposed Route	Cheat Mountain Route Variation
Length (total)	miles	1.4	1.4
Primary U.S. or State/Commonwealth Highway	number	0	0
Other State/Commonwealth or local roads	number	2	2
Adjacent to existing linear corridor facilities (total)	miles	1.2	0.1
Federal lands crossed - Monongahela National Forest	miles	1.2	1.2
State/Commonwealth lands crossed (total)	miles	0.0	0.0
Private lands crossed	miles	0.2	0.2
Conservation easements crossed	miles	0.0	0.0
U.S. Forest Service management prescription units crossed – Monongahela National Forest			
Spruce and Spruce-hardwood Ecosystem Management	miles	1.2	1.2
Vegetation Diversity	miles	0.0	0.0
Wildlife Habitat Emphasis	miles	0.0	0.0
Backcountry Recreation	miles	0.0	0.0
Cheat Mountain salamander occupied habitat buffer	miles	0.5	0.5
Land use types crossed - Forested	miles	1.3	1.3
Land use types crossed – Developed, Open Space	miles	0.1	0.1
U.S. Geological Survey karst topography crossing	miles	0.8	1.1
Distance from residence	feet	20	220
Recreational trails crossed	number	0	0
Wetlands crossed – forested	miles	0.0	0.0
Wetlands crossed – emergent	miles	0.0	0.0
Intermittent waterbodies crossed	number	0	0
Perennial waterbodies crossed	number	1	1
Battlefield study areas – Cheat Mountain	miles	1.4	1.4

Starting approximately at MP 67.4 of the proposed route, the route variation initially heads east for 0.2 mile to an existing Monongahela Power Company 138 kV electric transmission line. It parallels the west side of the existing electric transmission line for approximately 0.2 mile, then heads south/southeast for approximately 0.3 mile, crossing Shavers Fork and passing south of a private residence. It then crosses to the east side of the existing electric transmission line corridor, and parallels this existing corridor to the southeast for approximately 0.7 mile. This segment of the route variation is between the existing electric transmission line and U.S. Highway 250. The route variation reconnects to the proposed route approximately at MP 68.8.

The Cheat Mountain Route Variation is the same length as the proposed route, though 1.1 fewer miles are adjacent to existing electric transmission corridor. The route variation is located further from the Cheat Mountain salamander occupied habitat than the proposed route. Both routes are on the opposite side of the existing 100-foot-wide electric transmission line corridor from the occupied habitat, which will likely prevent impacts on the habitat and species during construction and operation of the ACP. However, the route variation would avoid an area of steep side slope along the transmission line corridor and would reduce the need for additional construction workspace associated with the sloped area. While the proposed route crosses 0.3 mile less of USGS karst topography than the route variation, the route variation is approximately 200 feet further away from an existing private residence. Both routes are located entirely within

the Cheat Mountain battlefield study area and both cross Shavers Fork. Crossings of other features are similar for the two routes.

Because the Cheat Mountain Route Variation is located further from the Cheat Mountain salamander occupied habitat, crosses less steep side slope terrain, and is further from a residence, Atlantic has incorporated this route variation into the proposed route.

10.9.2 Cow Knob HDD Route Variation

On July 30, 2015, the USFS submitted comments to the FERC on Atlantic's and DTI's draft Resource Reports for the ACP and SHP. In these comments, the USFS said that alternatives to the proposed AP-1 mainline route on the GWNF should be developed to avoid impacts on the Cow Knob salamander by routing around potential habitat for this species or by using the HDD construction method to cross underneath habitat areas. Additionally, on September 17, 2015, the USFS sent a follow-up letter to the FERC reiterating its previous comments on the Cow Knob salamander and providing additional information on potential impacts on the species. The letter describes a meeting of the Cow Knob Conservation Team on August 24, 2015, where the team concluded that the currently proposed AP-1 mainline route is not consistent with the Cow Knob Salamander Conservation Agreement, the Virginia Draft State Wildlife Action Plan, or the GWNF LRMP. The letter identified two options for potential alternatives:

1. Select a new pipeline route, which would have to go south of Chestnut Ridge and South Sister Knob, or north of Romney, West Virginia, to avoid the habitat areas; or

2. Bore through Shenandoah Mountain, which would leave habitat on the mountain ridge intact for Cow Knob salamanders.

Atlantic has completed a review of the first alternative pipeline route option proposed in the September 17, 2015 letter and has been unable to identify such a route that can be built in time to meet the customers' needs. As noted above, the overall environmental impact of the other identified routes outside USFS lands is more significant. Atlantic has also completed a review of the second HDD option proposed in the September 17, 2015 letter. In accordance with this recommendation, Atlantic is proposing the installation of two HDDs on and in the vicinity of Shenandoah Mountain. The HDDs will require an adjustment of the proposed route for approximately 4.4 miles in Highland and Augusta Counties, Virginia. The HDDs will avoid impacts on populations of Cow Knob salamanders and their habitat on and in the vicinity of Shenandoah Mountain. Figure 3.2-1 (provided in Appendix B of this filing as Privileged Information) depicts the alternative route, referred to hereafter as the "Cow Knob HDD Route Variation", including the locations of the HDDs, relative to the proposed route. Comparative data on route variation and the corresponding segment of the proposed route are provided in Table 3.2-1.

TABLE 3.2-1

Cow Knob HDD Route Variation for the Atlantic Coast Pipeline

Features	Unit	Proposed Route	Cow Knob HDD Route Variation (open-cut installation and HDD pipeline stringing area) [a]
Length (total)	miles	4.3	4.1 (2.2)
Primary U.S. or State/Commonwealth Highway	number	0	0 (0)
Other State/Commonwealth or local roads	number	4	5 (4)
Adjacent to existing linear corridor facilities (total)	miles	0.0	0.0 (0.0)
Federal lands crossed - George Washington National Forest	miles	4.2	4.0 (1.7)
State/Commonwealth lands crossed (total)	miles	0.0	0.0 (0.0)
Private lands crossed	miles	0.1	0.1 (0.6)
Conservation easements crossed	miles	0.0	0.0 (0.0)
USFS management prescription units crossed			
Mosaics of wildlife habitat	miles	4.2	4.0 (1.7)
Eligible recreation river corridor	miles	0.0	0.0 (0.0)
Special biological area	miles	0.0	0.0 (0.0)
Length of ground disturbance above 2,500 feet elevation [b]	miles	4.0	0.7
Land use types crossed - Forested	miles	4.2	4.1 (2.1)
U.S. Geological Survey karst topography crossing	miles	0.0	0.0 (0.0)
Recreational trails crossed	number	0	0 (0)
Wetlands crossed – forested	miles	0.0	0.0 (0.0)
Wetlands crossed – emergent	miles	0.0	0.0 (0.0)
Intermittent waterbodies crossed	number	0	8 (8)
Perennial waterbodies crossed	number	1	4 (4)
Battlefield study areas	miles	0.0	0.0 (0.0)

[a] The Cow Knob HDD Route Variation includes the length of the pipeline to be installed via both open-cut and horizontal directional drill (i.e., total) between MPs 108.8 and 113.2. The impact estimates for the open-cut installation and pipeline stringing areas (i.e., surface area disturbance) are provided parenthetically. These estimates exclude the length of pipeline to be installed by HDD because no ground disturbing activities will occur in these areas.

[b] The length of ground disturbance above 2,500 feet in elevation only includes areas where ground disturbing activities will occur. The lengths of sections of HDD installation are not included.

Starting on the west side of Shenandoah Mountain along the currently proposed AP-1 mainline, the route variation initially heads east along a valley for approximately 0.5 mile to the proposed exit point for the first HDD. From this point, the route variation heads southeast for approximately 1.3 miles to the entry point for the first HDD, which is located in a valley along an unnamed tributary to Hodges Draft. This section of the route variation will be installed underneath Shenandoah Mountain by HDD. The route variation then continues southeast for approximately 0.5 mile adjacent to the unnamed tributary to Hodges Draft. The route then heads to the northwest for approximately 0.6 mile to the entry point for the second HDD on the east side of Hodges Draft. From here, the route variation continues for 1.1 miles northwest to the exit point for the second HDD in a valley along Leslie Lick Hollow. This section of the route variation will be installed by HDD beneath a south trending ridge approximately 1.0 mile southeast of Signal Corps Knob. The route variation then continues southeast for 0.2 mile, reconnecting to the currently proposed route on a ridge south of Leslie Lick Hollow. An approximately 0.5-mile-long workspace east of the HDD exit point near Leslie Lick Hollow will be required to assemble and string the pipeline for the HDD.

Cow Knob salamanders are typically found in the GWNF at elevations greater than 3,000 feet above mean sea level, but have been found on occasion at elevations greater than 2,500 feet above mean sea level. Relative to the proposed route, the route variation will reduce ground disturbing activities in areas with elevations greater than 2,500 feet from 4.0 miles to 0.7 mile due to the proposed HDD crossings of habitat areas on Shenandoah Mountain and the ridgeline southeast of Signal Corps Knob. The route variation additionally is approximately 0.2 mile shorter than the proposed route; includes 2.1 miles less of open-cut construction; and avoids 2.1 miles (approximately 31.8 acres) of forested land, primarily due to the HDDs. The HDDs also will address USFS concerns regarding access for off-highway vehicles (OHVs) to Signal Corps Knob via the cleared right-of-way.

The Cow Knob HDD Route Variation will require approximately 0.5 mile of open-cut pipeline construction in an area parallel to an unnamed, intermittent tributary to Hodges Drafts. Once wetland and waterbody delineations and other environmental surveys in this area are complete, and if necessary, Atlantic will request a variance from the FERC for constructing parallel to and/or within 50 feet of this intermittent waterbody. The Cow Knob HDD Route Variation requires 8 more intermittent and 3 more perennial waterbody crossings than the proposed route. Crossings of other environmental features are similar for the two routes.

Because the Cow Knob HDD Route Variation avoids the Cow Knob salamander habitat areas, reduces tree clearing on Shenandoah Mountain and the ridgeline southeast of Signal Corps Knob, addresses concerns regarding OHV access to Signal Corps Knob, and follows the recommendation of the September 17, 2015 USFS letter, Atlantic and DTI have adopted and incorporated this route variation into the proposed route. Atlantic and DTI believe that the Cow Knob HDD Route Variation is consistent with the GWNF LRMP and can be approved by the USFS.

As noted above, Cow Knob salamanders are typically found in the GWNF at elevations greater than 3,000 feet above mean sea level, but have been found on occasion at levels greater than 2,500 feet above mean sea level. In the unexpected event that some Cow Knob salamanders are discovered within the Cow Knob HDD Route Variation, Atlantic proposes that the route is still consistent with the GWNF LRMP.[36] The GWNF LRMP states that areas where Cow Knob salamanders are found are "unsuitable for designation of new utility corridors, utility rights-of-way, or communication sites unless there is an over-riding demonstrated public need or benefit." GWNF LRMP at 4-116 (emphasis added).

[36] The requirements of the 1994 Conservation Agreement between USFS and the U.S. Fish and Wildlife Service were only intended to govern management of Cow Knob salamander habitat until the GWNF developed its own management plan for those lands. The relevant portions of the November 2014 GWNF LRMP now provide the applicable management standards.

The GWNF LRMP does not define "over-riding demonstrated public need or benefit" and USFS has not specifically defined this standard. However, in the context of timber sale contracts, USFS has found an over-riding public interest exists because:

> (1) it allows the Forest Service to accomplish land management objective in a cost-effective manner; (2) it increases competition for National Forest System timber sales and can result in higher prices paid for timber; (3) it helps provide a continuous timber supply to the public in accordance with the Organic Administration Act; (4) it helps accomplish fuels reduction projects; and (5) it helps maintain the economic stability of communities dependent upon the timber industry.

73 Fed. Reg. 53817 (Sept. 17, 2008), Forest Service Determination of Substantial Overriding Public Interest for Extending Certain Timber Sale Contracts. USFS has also referred to this standard in discussions regarding land and resource management plan revisions for other national forests, but again without any specific definition. *See, e.g.*, USDA Briefing Paper: Pacific Crest Trail Management Area Direction Forest Plan Revision at 2-3 (prohibited activities include "new utility lines unless they represent the only feasible and prudent alternative to meet an overriding public need").

The ACP meets the over-riding demonstrated public need or benefit standard in the following ways:

- As a threshold matter, as a part of its jurisdiction and issuance of the Certificate, FERC will make a finding that construction and operation of the Projects is in the public convenience and necessity.

- The Projects will increase access to natural gas that will result in a reduced dependence on coal. A reduction in the use of coal will reduce negative impacts to the environment and human health, support the Federal government's commitment to cleaner air and reduced carbon emissions, and is critical to achieving the requirements of the Mercury and Air Toxics Standards rule as well as carbon reduction targets of the Clean Power Plan in a timely manner.

- Given that approximately 96 percent of the capacity is already subscribed to regulated public utility companies, the Projects will provide increased reliability and security of critically needed supplies of natural gas from supply areas to current demand areas in Virginia and North Carolina.

- The Projects provide a reliable back-up source of energy for times in the future when renewable energy sources cannot meet demand.

- The Projects will lead to an estimated $377 million in annual energy cost savings for consumers.

- The Projects will create jobs, including an estimated 17,240 jobs during the construction phase and 2,200 jobs once the Projects are online.

- The Projects will increase tax revenues, including a projected $4.2 million in average annual local tax revenues during construction and approximately $25 million in average annual local tax revenues once the Projects go online.

- Reclamation involving appropriate species of trees and other vegetation to replace and enhance habitat will benefit the Cow Knob salamander populations located in higher elevations from the Cow Knob HDD Route Variation project area and assist the USFS in accomplishing its Cow Knob salamander and land management objectives contained within the GWNF LRMP.

Although it is generally self-evident that each of these points demonstrate that the Projects either meet a public need or provide a public benefit, the importance of natural gas has also been affirmed by recent governmental action. For example, in a 2012 Executive Order, President Obama stated:

> [Natural gas's] production creates jobs and provides economic benefits to the entire domestic production supply chain, as well as to chemical and other manufacturers, who benefit from lower feedstock and energy costs. By helping to power our transportation system, greater use of natural gas can also reduce our dependence on oil. And with appropriate safeguards, natural gas can provide a cleaner source of energy than other fossil fuels.
>
> For these reasons, *it is vital that we take full advantage of our natural gas resources*, while giving American families and communities confidence that natural and cultural resources, air and water quality, and public health and safety will not be compromised.

Exec. Order No. 13605, 77 Fed. Reg. 23,105 (April 17, 2012) (emphasis added).

Similarly, the 2014 Virginia Energy plan stated:

> A system of energy and electricity transmission and distribution that is reliable, resilient and cost-effective is the backbone of any healthy economy. This requires appropriate investments by the private sector, as well as responsible support and policies by the public sector. *In many areas of Virginia, access to natural gas can mean the difference between a growing and vibrant economic base and one of stagnation.* Virginia must be committed to giving localities throughout the Commonwealth all of the economic development tools they need to attract new businesses and grow existing businesses. *A modern transmission and distribution system that provides the capacity needed in all parts of Virginia is an important component of building a truly diverse economy.*

Virginia Energy Plan, Commonwealth of Virginia, Department of Mines, Minerals and Energy (Oct. 1, 2014), https://www.dmme.virginia.gov/DE/LinkDocuments/2014_

VirginiaEnergyPlan/VEP2014.pdf (emphasis added); *see also* Energy Plan 2013-2017, State of West Virginia (Mar. 4, 2013), http://www.wvcommerce.org/App_Media/assets/doc/energy/5yrplan/ENERGY_5year_Plan_ALL.pdf (listing as one of the Governor's Energy Recommendations that West Virginia "[m]onitor and encourage development of midstream natural gas gathering and processing facilities as well as pipeline infrastructure"); Press Release, EPA Proposes New Commonsense Measures to Cut Methane Emissions from the Oil and Gas Sector/Proposal Cuts GHG Emissions, Reduces Smog-Forming Air Pollution and Provides Certainty for Industry (Aug. 18, 2015), http://yosemite.epa.gov/opa/admpress.nsf/f0d7b5b28db5b04985257359003f533b/e5f2425e2e668a2b85257ea5005176fa!OpenDocument ("Cleaner-burning energy sources like natural gas are key compliance options for our Clean Power Plan and we are committed to ensuring safe and responsible production that supports a robust clean energy economy" (Statement of Gina McCarthy, EPA Administrator).

For all the reasons stated above, should any Cow Knob salamander be discovered outside its typical habitat in the Cow Knob HDD Route Variation project area, the USFS can determine that the Projects should proceed in accordance with the GWNF LRMP as there is an "over-riding public need or benefit" due to the fact that the Projects: satisfy the long-term needs of society as a whole; satisfy a need recognized as critical by both Federal and State governments; address and promote national energy goals; reduce impacts and harms to the public; and implement habitat enhancement measures that will further protect and enhance the Cow Knob salamander and its habitat. A finding of "overriding public need or benefit" will enable the USFS to determine that the Projects are consistent with the GWNF LRMP or to amend the GWNF LRMP to accommodate the pipeline.

10.10 ROUTE ADJUSTMENTS

Atlantic and DTI made and continue to make a number of minor route adjustments to optimize the baseline route as a result of ongoing routing, biological, cultural resources, and civil field surveys. The route adjustments generally measure less than 2 miles in length, pass within a quarter mile or less of the baseline routes, and do not significantly affect the total length of the routes. The route adjustments were adopted without a formal alternatives analysis, as the basis for the adjustment was intuitive and practical (e.g., a slight shift in the centerline to avoid a wetland). Individually, the refinements to the routes are small, but collectively they reduce impacts on environmental resources. Table 10.10-1 lists the route adjustments to date that have been incorporated into the proposed ACP and SHP pipeline routes and the rationale for each adjustment. The table below shows route adjustments that have occurred between MPs 44 and 179 of the AP-1 mainline, which includes the Monongahela National Forest, George Washington National Forest, and Appalachian Trail South Major Route Alternatives.

TABLE 10.10-1

Select Route Adjustments Incorporated into the Proposed Atlantic Coast Pipeline

Route Adjustment	Approximate Mileposts	State	Rationale
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
Queens Road	39.0 to 40.1	WV	Adjustment to avoid a wetland
Old Mine	63.4 to 64.2	WV	Adjustment to center pipeline within former strip mine
White Top Road	67.2 to 67.8	WV	Adjustment to increase collocation with existing utility corridor.
Simmons Road	70.0 to 71.5	WV	Adjustment to reduce length of access roads required, increase the distance to a residence, and optimize crossing of West Fork Greenbrier River
Cherry Run Road	70.5 to 71.9	WV	Adjustment to reduce crossing of West Virginia Northern Flying Squirrel habitat
Gladys Durbin Road	71.6 to 72.1	WV	Adjustment to reduce side-slope construction
Mount Lick Road	73.0 to 73.4	WV	Adjustment to reduce a wetland crossing
Johns Run Road	74.4 to 74.8	WV	Adjustment to reduce side-slope construction
Thornwood Road	76.3 to 77.2	WV	Adjustment to optimize crossing angle of East Fork Greenbrier River
Laurel Fork	83.7 to 85.2	VA	Adjustment to avoid a waterbody crossing
Jackson River	88.9 to 89.2	VA	Adjustment to avoid a wetland
Dug Bank Road	90.7 to 91.4	VA	Adjustment to avoid a waterbody crossing and reduce tree clearing
Little Doe Hill	99.1 to 99.9	VA	Adjustment to meet a landowner request
Bullpasture River Road	102.3 to 104.0	VA	Adjustment to reduce tree clearing
Wilson Hollow Lane	107.7 to 108.6	VA	Adjustment to avoid a waterbody crossing
Braley Pond Road	116.3 to 117.0	VA	Adjustment to optimize crossing of Calfpasture River
Hangars Mill Road	128.1 to 128.8	VA	Adjustment to avoid a karst feature
Cochrans Mill Road	139.2 to 140.2	VA	Adjustment to avoid a cultural resource site and a cave
White Hill Road	140.8 to 141.6	VA	Adjustment to avoid a waterbody crossing
Christians Creek	141.6 to 142.6	VA	Adjustment to avoid a wetland
Rising Sun Lane	153.3 to 154.8	VA	Adjustment to increase distance from residences and reduce tree clearing
Wintergreen Drive	158.7 to 159.2	VA	Adjustment to avoid road crossing
Winery Lane	160.9 to 161.4	VA	Adjustment to increase distance from residences
Glenthorne Loop Road	163.1 to 163.7	VA	Adjustment to minimize crossing of Bold Rock Cidery

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